REPORT RESUMES

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MANUAL OF PROCEDURES AND CRITERIA FOR CAMPUS DEVELOPMENT AND CAPITAL OUTLAY PLANNING.

BY- MASON, THOMAS R. HELDMAN, HERBERT

TAYLOR, LIEBERFELD AND HELDMAN INC., NEW YORK, N.Y

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DESCRIPTORS- *CAMPUS PLANNING, *CAPITAL OUTLAY (FOR FIXED ASSETS), *COLLEGE BUILDINGS, *FACILITY GUIDELINES, *FACILITY UTILIZATION RESEARCH, CONSTRUCTION COSTS, CRITERIA, EDUCATIONAL COMPLEXES, LAND USE,

THE PURPOSE OF THIS MANUAL IS TO PROVIDE A BASIS FOR SYSTEMATICALLY PROGRAMMING THE REQUIREMENTS FOR PHYSICAL PLANT AND LAND TO ACCOMMODATE THE NEEDS OF AN INSTITUTION UNDER A SPECIFIED SET OF CIRCUMSTANCES. THE MANUAL IS ORGANIZED INTO SIX BROAD ELEMENTS--(1) ACTIVITY LEVELS OF ENROLLMENT, INSTRUCTIONAL WORKLOADS AND STAFF REQUIREMENTS, (2) PLANNING CRITERIA FOR UTILIZATION AND PHYSICAL FACTORS, (3) SPACE REQUIREMENTS NEEDED FOR ANY FUNCTIONAL CATEGORY OF THE INSTITUTION, (4) BUILDING OCCUPANCY PROGRAMS FOR THE DISTRIBUTION OF INSTITUTIONAL SPACE REQUIREMENTS AMONG PRESENT AND FUTURE BUILDINGS, (5) CAMPUS DEVELOPMENT AND LAND REQUIREMENTS FOR BUILDINGS, PARKING FACILITIES, AND ATHLETIC FACILITIES, AND (6) CAPITAL BUDGETING FOR MAINTENANCE AND ALTERATION OF PRESENT BUILDINGS, COSTS OF NEW CONSTRUCTION AND LAND ACQUISITION. WORKSHEETS ARE PROVIDED FOR A THOROUGH COLLECTION OF DATA AND ANALYSIS IN THE ABOVE NOTED AREAS. (HH)

Thomas R. Mason
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ED015628

REPORT TO
ASSOCIATION OF STATE INSTITUTIONS OF HIGHER EDUCATION
IN COLORADO

MANUAL OF PROCEDURES AND CRITERIA
FOR
CAMPUS DEVELOPMENT AND
CAPITAL OUTLAY PLANNING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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TABLE OF CONTENTS

Page

PREFACE xxiv

PART I INTRODUCTION

CHAPTER I Campus Development Programming: A Synoptic View 4

PART II ACTIVITY LEVELS 18

CHAPTER 2 Enrollment 20

CHAPTER 3 Instructional Workloads 34

CHAPTER 4 Staff Requirements 72

PART III PHYSICAL PLANT SPACE REQUIREMENTS 94

CHAPTER 5 Classroom Space 98

CHAPTER 6 Special Purpose Instructional Space 124

CHAPTER 7 Office Space 182

CHAPTER 8 Research Space 202

CHAPTER 9 Library Space 224

CHAPTER 10 Museum and Gallery Space 252

CHAPTER 11 Athletic Activities Space 257

CHAPTER 12 Housing Space 277

CHAPTER 13 Food Service Space 297

CHAPTER 14 Staff and Student Service Space 310

CHAPTER 15 Miscellaneous Other Space 316

CHAPTER 16 Physical Plant Maintenance and Operations Space 318

CHAPTER 17 Aggregate Space Requirements 324

Page

PART IV PHYSICAL PLANT CONSTRUCTION, DEMOLITION AND REMODELING PROGRAM 332

CHAPTER 18 Physical Plant Inventory 334

CHAPTER 19 Building Program Summary 347

PART V LAND REQUIREMENTS 377

CHAPTER 20 Land Requirements 379

PART VI CAPITAL BUDGETING 403

CHAPTER 21 Capital Outlay Projections 404

APPENDIX A CHECK LIST OF SELECTED QUESTIONS ON INSTITUTIONAL POLICIES AND PLANS RELATING TO CAMPUS DEVELOPMENT PROGRAMMING 429

APPENDIX B ENNUMERATION OF RECOMMENDED SUBJECT FIELD CATEGORIES AND CODES OF INSTRUCTIONAL AND RESEARCH UNITS FOR USE IN PHYSICAL PLANT PROGRAMMING STUDIES 441

APPENDIX C CLASSIFICATION OF SELECTED POSITION TITLES FOR USE IN INSTITUTIONAL STAFF CENSUSES AND PROJECTIONS 447

APPENDIX D PHYSICAL PLANT INVENTORY SYSTEM 455

LIST OF TABLES

		Page
5.1	CLASSROOM SPACE: General Utilization Standards Recommended for Classroom-Type Facilities	110
5.2	CLASSROOM SPACE: Recommended Planning Criteria for the Allocation of Space to Classroom-Type Facilities	111
5.3	CLASSROOM SPACE: Alternate Basis for Calculating Allocation to Primary Component of Classroom-Type Facilities	112
6.1	SPECIAL PURPOSE INSTRUCTIONAL SPACE: Teaching Laboratory Utilization Rates Recommended by A. W. Baxter, Jr., 1960	133
6.2	SPECIAL PURPOSE INSTRUCTIONAL SPACE: Recommended Planning Criteria for the Allocation of Space to the Primary Component of Special Purpose Instructional Facilities, by Subject and Division	170
6.3	SPECIAL PURPOSE INSTRUCTIONAL SPACE: Recommended Planning Criteria for the Allocation of Space to the Service Component of Special Purpose Instructional Facilities, by Subject	171
7.1	OFFICE SPACE: Recommended Planning Criteria for the Allocation of Space to Staff Work Stations (or the Primary Component) in Office-Type Facilities	190
7.2	OFFICE SPACE: Recommended Planning Criteria for the Allocation of Space to the Service Component of Office Facilities; Planning Ratios, Office Service Space to Total and Primary Office Space	191

Page

7.3 OFFICE SPACE: Illustrative Unit Area Allocation Criteria for Selected Service Elements in Office-Type Facilities 192

8.1 RESEARCH SPACE: Recommended Planning Criteria for the Allocation of Space to Staff Project Component of Primary Research Facilities, by Subject 207

8.2 RESEARCH SPACE: Recommended Planning Criteria for the Allocation of Space to Service Component of Research Facilities, by Subject 213

9.1 LIBRARY SPACE: Recommended Planning Criteria for the Allocation of Space to Selected Components of Library Facilities 234

10.1 MUSEUM AND GALLERY SPACE: Recommended Planning Criteria for the Allocation of Space to Museum and Gallery Facilities 253

11.1 ATHLETIC ACTIVITIES SPACE: Recommended Planning Criteria for Selected Components of Indoor Physical Education and Athletic Activities Facilities 262

11.2 ATHLETIC ACTIVITIES SPACE: Recommended Planning Criteria for the Distribution of Indoor Physical Education and Athletic Activities Facilities among Selected Categories of Space 263

12.1 HOUSING SPACE: Recommended Planning Criteria for the Allocation of Space to Housing Facilities 280

13.1 FOOD SERVICE SPACE: Recommended Planning Criteria for the Allocation of Space to Food Service Facilities 300

Page

14.1 STAFF AND STUDENT SERVICE SPACE: Recommended Planning Criteria for the Allocation of Space to Staff and Student Services Facilities 313

16.1 PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE: Recommended Planning Criteria for the Allocation of Space to Physical Plant Maintenance and Operations Facilities 320

19.1 BUILDING PROGRAM SUMMARY: Recommended Coefficients for Converting Program (Gross) Area Estimates to Gross (Program) Area Estimates for New Building and Additions to Existing Structures 355

20.1 LAND REQUIREMENTS: Recommended Planning Criteria for Use in the Allocation of Land to Selected Uses 385

21.1 CAPITAL OUTLAY PROJECTIONS: Typical Schedule for Major Building Project 412

21.2 CAPITAL OUTLAY PROJECTIONS: F. W. Dodge Construction Cost Index; Labor and Materials, Brick and Concrete Commercial and Factor Buildings, Denver Area 413

D.1 Functional Division Code for Physical Plant Space Inventory System 456

D.2 Alternate Numerical Classification Code for Physical Plant Space Inventory System 460

LIST OF ILLUSTRATIONS

		Page
PLATE 1-1	Campus Development Programming; a Graphic Analysis	15
PLATE 5-1.	Classroom Space; Typical Physical Planning Criteria	115
PLATE 6-1	Teaching Laboratory Space; Typical Elementary Biology Facilities	169
PLATE 6-2	Teaching Laboratory Space; Typical Elementary Chemistry Facilities	170
PLATE 6-3	Teaching Laboratory Space; Typical Elementary Physics Facilities	171
PLATE 7-1	Office Space; Typical Office Work Station Criteria	193
PLATE 8-1	Research Space; Typical Physical Planning Criteria	212
PLATE 9-1	Library Space; Typical Physical Planning Criteria; Reader Space and Book Storage	237
PLATE 12-1	Housing Space; Physical Planning Criteria for Double Occupancy Unit	281

LIST OF WORKSHEETS

Page

2.1 ENROLLMENT: Projected Planning Stages, Years in Which Planning Stages Are Expected, and Full-Time Equivalent and Head Count Enrollments 27

2.2 ENROLLMENT: Distribution of Full-Time Equivalent and Head Count Enrollment at Selected Planning Stages, by Level 28

2.3 ENROLLMENT: Indexes of Growth in Full-Time Equivalent and Head Count Enrollment from Base Year to Selected Planning Stages, by Level 29

2.4 ENROLLMENT: Distribution of Head Count Enrollment at Selected Planning Stages by Sex, Marital Status and Residence Category 30

2.5 ENROLLMENT: Indexes of Growth in Head Count Enrollment from Base Year to Selected Planning Stages, by Sex, Marital Status and Residence Category 32

3.1 INSTRUCTIONAL WORKLOADS: Historical Distribution of Instructional Workloads by Subject Field and Course Level, 19__ to 19__ 44

3.2 INSTRUCTIONAL WORKLOADS: Adjustment of Total and Distribution of Instructional Workloads for Purposes of Computing Distributional Pattern to Be Used as Planning Assumptions at Projected Enrollment Targets, by Subject Field and Course Level, 19__ to 19__ 46

Page

3.3 INSTRUCTIONAL WORKLOADS: Historical Distribution of Instructional Workloads, Unweighted and Weighted, by Subject Field and Course Level, 19__ to 19__ 48

3.4 INSTRUCTIONAL WORKLOADS: Computation of Index of Trend Variance, by Subject Field and Course Level 50

3.5 INSTRUCTIONAL WORKLOADS: Projection of Instructional Workloads at Specified Planning Stage, by Subject Field, Course and Level of Student Registrants 52

3.6 INSTRUCTIONAL WORKLOADS: Policy Planning Assumptions for Workload Characteristics of Individual Course Offerings, by Subject Field, Course and Type of Meeting 54

3.7 INSTRUCTIONAL WORKLOADS: Policy Planning Assumption for Converting Expression of Projected Instructional Workloads to Selected Alternate Forms 58

3.8 INSTRUCTIONAL WORKLOADS: Expression of Projected Instructional Workloads at Specified Planning Stage in Terms of Student Credit Hours, Full-Time Equivalent Enrollments and Head Count Number of Course Registrants, by Subject Field and Course 60

3.9 INSTRUCTIONAL WORKLOADS: Expression of Projected Instructional Workloads at Specified Planning Stage in Terms of Number of Meeting Groups per Week, Clock Hours of Class Meetings per Week, and Number of Student Periods of Meeting per Week, by Subject Field, Course and Type of Meeting 62

Page

3.10 INSTRUCTIONAL WORKLOADS: Summary of Projected Instructional Workloads at Specified Planning Stage, in Terms of Clock Hours of Class Meetings and Student Periods of Meeting per Week, by Department and Type of Meeting 66

3.11 INSTRUCTIONAL WORKLOADS: Summary of Projected Instructional Workloads in Terms of Aggregate Clock Hours of Class Meetings and Aggregate Student Periods of Meeting per Week, by Type of Meeting and Planning Stage 68

3.12 INSTRUCTIONAL WORKLOADS: Distribution of Projected Instructional Workload Expressed as Clock Hours of Class Meetings per Week, at Specified Planning Stage, by Department, Type of Meeting Facility, and Class Size Range 70

4.1 STAFF REQUIREMENTS: Distribution of Personnel by Department, Position Category and Time Status 78

4.2 STAFF REQUIREMENTS: Description of Policy Planning Assumptions for Use in Projection of Personnel Requirements at Specified Planning Stage 80

4.3 STAFF REQUIREMENTS: Projection of Faculty Requirements at Specified Planning Stage, by Subject Field or Department and Course Level 82

4.4 STAFF REQUIREMENTS: Summary of Projected Faculty Requirements at Specified Planning Stage, by Subject Field or Department 84

Page

4.5 STAFF REQUIREMENTS: Projection of Non-Faculty Staff Requirements at Specified Planning Stage, by Subject Field or Department and Position Category 86

4.6 STAFF REQUIREMENTS: Summary of Projected Staff Requirements at Specified Planning Stage, by Department and Position Group 88

4.7 STAFF REQUIREMENTS: Summary of Projected Staff Requirements, by Department and Planning Stage 90

5.1 CLASSROOM SPACE: Room and Student Station Utilization Criteria to Be Used in Estimating Capacity Requirements in Classroom-Type Facilities 116

5.2 CLASSROOM SPACE: Projection of Room and Student Station Capacity Requirements in Classroom-Type Facilities, by Capacity Size Range 119

5.3 CLASSROOM SPACE: Projection of Space Required in Classroom-Type Facilities, by Room Size Range and Primary-Service Space Classification 120

5.4 CLASSROOM SPACE: Summary of Space Required in Classroom-Type Facilities, at Selected Planning Stages 122

6.1 SPECIAL PURPOSE INSTRUCTIONAL SPACE: Room and Student Station Utilization Criteria to Be Used in Projecting Capacity Requirements in All Special Purpose Instructional Facilities 173

Page

6.2 SPECIAL PURPOSE INSTRUCTIONAL SPACE: Projection of Room and Student Station Capacity Requirements in Special Purpose Instructional Facilities 174

6.3 SPECIAL PURPOSE INSTRUCTIONAL SPACE: Projection of Space Required in Special Purpose Instructional Facilities 176

6.4 SPECIAL PURPOSE INSTRUCTIONAL SPACE: Summary of Space Required in Special Purpose Instructional Facilities at Selected Planning Stages, by Level and Primary-Service Space Classification 178

6.5 SPECIAL PURPOSE INSTRUCTIONAL SPACE: Summary of Space Required in Special Purpose Instructional Facilities at Selected Planning Stages, by Department 180

7.1 OFFICE SPACE: Projection of Work Station Capacity Requirements for Office-Type Accommodations, by Staff Category and Type of Work Station 194

7.2 OFFICE SPACE: Projection of Space Required in Office-Type Accommodations, by Type of Work Station and Primary-Service Space Classification 196

7.3 OFFICE SPACE: Summary of Space Required in Office-Type Accommodations by Department and Primary-Service Space Classification 198

7.4 OFFICE SPACE: Summary of Space Required in Office-Type Accommodations at Selected Planning Stages, by Department 200

Page

8.1 RESEARCH SPACE: Projection of Staff Project Research Space Requirements at Selected Planning Stages, by Primary-Service Space Classification 218

8.2 RESEARCH SPACE: Projection of Space Required for Large Scale Specialized Equipment and Technical Services Used in Supporting Research Programs, by Primary-Service Space Classification 220

8.3 RESEARCH SPACE: Summary of Research Space Requirements at Selected Planning Stages, by Space Category 222

8.4 RESEARCH SPACE: Summary of Research Space Requirements at Selected Planning Stages, by Department 223

9.1 LIBRARY SPACE: Projection of Reader Station Capacity Requirements in Library Facilities, by Planning Stage and Type of Station 238

9.2 LIBRARY SPACE: Projection of Space Required to Accommodate Reader Station Capacity Requirements in Library Facilities, by Planning Stage and Type of Station 240

9.3 LIBRARY SPACE: Projection of Book Storage Capacity Requirements in Library Facilities, by Planning Stage and Character of Storage Facility 242

9.4 LIBRARY SPACE: Projection of Space Required to Accommodate Book Storage Capacity Requirements in Library Facilities, by Planning Stage and Character of Storage Facility 244

Page

9.5 LIBRARY SPACE: Projection of Program Area Requirements for Library Service Facilities and Summary of Total Library Space Requirements, by Planning Stage and Space Category 247

9.6 LIBRARY SPACE: Distribution of Program Area Requirements for Library Service Facilities, by Type of Space and Planning Stage 248

9.7 LIBRARY SPACE: Summary of Program Area Requirements for Library Facilities at Specified Planning Stage, by Library Unit and Space Category 250

9.8 LIBRARY SPACE: Summary of Program Area Requirements for Library Facilities, by Library Unit and Planning Stage 251

10.1 MUSEUM AND GALLERY SPACE: Space Requirements for Museum and Gallery Facilities, by Type of Space and Planning Stage 254

10.2 MUSEUM AND GALLERY SPACE: Summary of Space Requirements for Museum and Gallery Facilities, by Department and Planning Stage 256

11.1 ATHLETIC ACTIVITIES SPACE: Indoor Space: Summary of Activity Levels in Athletic and Physical Education Programs, by Type of Activity and Season; Base Year, 196_-6_ 264

Page

11.2 ATHLETIC ACTIVITIES SPACE: Indoor Space: Indexes of Growth for Use in Projecting Changes in Activity Levels in Athletic and Physical Education Programs, by Type of Activity 266

11.3 ATHLETIC ACTIVITIES SPACE: Indoor Space: Projection of Activity Levels in Athletic and Physical Education Programs, by Type of Activity 268

11.4 ATHLETIC ACTIVITIES SPACE: Indoor Space: Projection of Capacity and Space Requirements for Athletic and Physical Education Programs, by Activity Group 270

11.5 ATHLETIC ACTIVITIES SPACE: Indoor Space: Projection of Capacity and Space Requirements for Spectator Seating, by Type of Activity 272

11.6 ATHLETIC ACTIVITIES SPACE: Indoor Space: Space Requirements for Athletic Activities, by Principal Category 274

11.7 ATHLETIC ACTIVITIES SPACE: Indoor Space: Summary of Space Requirements for Athletic Activities, by Principal Category and Planning Stage 276

12.1 HOUSING SPACE: Single Students, Men: Capacity Requirements for Housing Facilities by Type of Occupancy and Planning Stage 282

12.2 HOUSING SPACE: Single Students, Women: Capacity Requirements for Housing Facilities, by Type of Occupancy and Planning Stage 284

Page

12.3 HOUSING SPACE: Married Students: Capacity Requirements for Housing Facilities, by Type of Occupancy and Planning Stage 286

12.4 HOUSING SPACE: Single Students, Men: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage 288

12.5 HOUSING SPACE: Single Students, Women: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage 290

12.6 HOUSING SPACE: Married Students: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage 292

12.7 HOUSING SPACE: Staff: Capacity and Space Requirements for Housing Facilities, by Type of Housing and Planning Stage 294

12.8 HOUSING SPACE: Summary of Space Requirements for Housing Facilities, by Housing Group and Planning Stage 296

13.1 FOOD SERVICE SPACE: Distribution of Food Service Workload at Peak During Interval, by Dining Arrangement Category and Type of Facility 302

13.2 FOOD SERVICE SPACE: Capacity Requirements in Food Service Facilities at Peak Dining Interval, by Dining Arrangement Category and Type of Facility 304

Page

13.3 FOOD SERVICE SPACE: Space Requirements for Food Service Facilities, by Dining Arrangement Category and Type of Facility 306

13.4 FOOD SERVICE SPACE: Summary of Space Requirements for Food Service Facilities, by Type of Facility, Dining Arrangement Category and Planning Stage 308

14.1 STAFF AND STUDENT SERVICE SPACE: Space Requirements for Staff and Student Service Facilities, by Facility and Population Category and Planning Stage 314

15.1 MISCELLANEOUS OTHER SPACE: Space Requirements for Miscellaneous Other Facilities Not Covered Elsewhere 317

16.1 PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE: Summary of Assignable Physical Plant Space to Be Serviced and Maintained, by Major Space Category and Planning Stage 321

16.2 PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE: Space Requirements for Physical Plant Maintenance and Operations Facilities, by Service Building Space Component and Planning Stage 322

17.1 AGGREGATE SPACE REQUIREMENTS: Distribution of Physical Plant Program Area Requirements at Specified Planning Stage, by Department and Space Category 326

17.2 AGGREGATE SPACE REQUIREMENTS: Summary of Physical Plant Program Area Requirements at Selected Planning Stages, by Principal Space Category 328

Page

17.3 AGGREGATE SPACE REQUIREMENTS: Summary of Total Physical Plant Program Area Requirements at Selected Planning Stages, by Department 329

18.1A PHYSICAL PLANT INVENTORY: Data Tabulation Sheet: Room Inventory 339

18.1 PHYSICAL PLANT INVENTORY: Building ____________; Tabulation of the Current Allocation of Net Available Area, by Space Category (Function) and Occupant (Department) 340

18.2 PHYSICAL PLANT INVENTORY: Summary Tabulation of Gross and Net Areas of Existing Buildings, by Building 342

18.3 PHYSICAL PLANT INVENTORY: Adjustment of Inventory Tabulation of Net Available Space to Reflect Capacity of Existing Buildings to Absorb Projected Space Programs 344

18.4 PHYSICAL PLANT INVENTORY: Department____________; Analysis of the Current Allocation of Net Available Area, by Space Category (Function) and Building 346

19.1 BUILDING PROGRAM SUMMARY: Comparison of Aggregate Program Area Requirements and Net Space Available in Existing Physical Plant to Obtain First Approximation of Over-all Deficit (Surplus) or Usable Space and Size of Construction Program Required to Remedy Deficiencies 356

19.2 BUILDING PROGRAM SUMMARY: Establishment of Priority Ranking in Building Program 358

Page

19.3 BUILDING PROGRAM SUMMARY: Building ________; Worksheet for Developing the Recommended Space Allocation Pattern at the Specified Planning Stage, by Space Category (Function) and Occupant (Department) 360

19.4 BUILDING PROGRAM SUMMARY: Department ________; Worksheet for Summarizing the Recommended Space Locational Pattern at the Specified Planning Stage, by Space Category (Function) and Building (Location) 362

19.5 BUILDING PROGRAM SUMMARY: Master Worksheet for Summarizing the Allocation of Departmental Program Area Requirements Among Existing and Projected Buildings, by Department and Building 364

19.6 BUILDING PROGRAM SUMMARY: Existing Structures: Demolition and Major Remodeling Projects 366

19.7 BUILDING PROGRAM SUMMARY: New Buildings and Additions to Existing Structures: Conversion of Program Area Estimates to Gross Area Requirements 368

19.8 BUILDING PROGRAM SUMMARY: Summary of Net and Gross Building Area Requirements, by Planning Stage 370

19.9 BUILDING PROGRAM SUMMARY: Summary of Net Area Allocations of Physical Plant as Building Program Progresses, by Space Category 374

20.1 LAND REQUIREMENTS: Estimate of Campus Acreage Required for Allocation to Building Sites, by Planning Stage 386

Page

20.2 LAND REQUIREMENTS: Summary of Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity; Base Year, 196_-6_ 388

20.3 LAND REQUIREMENTS: Indexes of Growth for Use in Projecting Changes in Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity 390

20.4 LAND REQUIREMENTS: Projection of Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity 392

20.5 LAND REQUIREMENTS: Projection of Capacity and Land Requirements for Outdoor Athletic and Physical Education Programs, by Type of Activity 394

20.6 LAND REQUIREMENTS: Projection of Capacity and Land Requirements for Outdoor Athletic Program Spectator Seating, by Type of Activity 396

20.7 LAND REQUIREMENTS: Estimate of Campus Average Required for Allocation to Outdoor Athletic and Physical Education Programs, by Planning Stage 398

20.8 LAND REQUIREMENTS: Estimate of Campus Acreage Required for Allocation to Parking 399

20.9 LAND REQUIREMENTS: Summary of Aggregate Campus Acreage Requirements, by Land Use Category and Planning Stage 401

Page

21.1 CAPITAL OUTLAY PROJECTIONS: Capital Outlay Requirements for Demolition and Major Remodeling Projects 414

21.2 CAPITAL OUTLAY PROJECTIONS: Capital Outlay Requirements for New Buildings and Additions to Existing Structures 416

21.2A CAPITAL OUTLAY PROJECTIONS: Alternate Worksheet for Estimating Capital Outlay Requirements for New Buildings and Additions to Existing Structures 418

21.3 CAPITAL OUTLAY PROJECTIONS: Capital Outlay Requirements for Land Acquisition 420

21.4 CAPITAL OUTLAY PROJECTIONS: Capital Outlay Requirements for Utility Service and Miscellaneous Other Capital Projects 421

21.5 CAPITAL OUTLAY PROJECTIONS: Master Schedule for Campus Development Program; Priority Phasing and Capital Costs for Demolition, Major Remodeling Projects, New Buildings and Additions to Existing Structures, Land Acquisition, and Utility Service and Miscellaneous Other Capital Projects, by Source of Funds 422

21.6 CAPITAL OUTLAY PROJECTIONS: Summary of Master Schedule for Campus Development Program; Capital Costs for Demolition, Major Remodeling Projects, New Buildings and Additions to Existing Structures, Land Acquisition, and Utility Service and Miscellaneous Other Capital Projects by Source of Funds and Planning Stage 424

Page

21.7 CAPITAL OUTLAY PROJECTIONS: Conversion of Master Schedule for Campus Development Program From Planning Stage Reference Base to Fiscal Year Reference Base, by Project, Expenditure Objective and Source of Funds 426

21.8 CAPITAL OUTLAY PROJECTIONS: Master Schedule for Campus Development Program; Moving-Five-Year Projection of Capital Outlay Requirements for All Capital Projects Requiring State Government Funding, by Project, Expenditure Objectives and Fiscal Year 428

PREFACE

In recognition of the need for systematic and coordinated planning of building and capital outlay requirements of the state colleges and universities, the Association of State Institutions of Higher Education in Colorado appointed a Work Group in the spring of 1962 to develop a comprehensive procedure for estimating long-range building needs. This group included representatives from each of the eight existing institutions. The staffs of the State Planning Division, the State Budget Office, and the Joint Budget Committee were invited to participate in all meetings of the Work Group and were supplied with all materials of the Procedure Manual as it was developed. The Association, with funds from the Governor's office, engaged the services of the planning firm of Taylor, Lieberfeld and Heldman, Inc. of New York. This firm has wide experience in planning facilities for higher education, as well as commercial, industrial, and governmental facilities. The firm was requested to supply workable floor area standards for the various types of facilities required by colleges and universities and to criticize the procedures as they were worked out.

The writing of the Procedure Manual began during the summer of 1962. In August, the consultant, the chairman of the Work Group, the staff director of the Association, and staff members of the State Planning Division and the State Budget Office visited all of the eight campuses to review existing facilities and to discuss the procedure with institutional officials. It was agreed that the building requirements would be planned at the levels of classroom and teaching laboratory utilization recommended by A. W. Baxter, Jr., in his 1960 report to the Legislative Committee on Education Beyond High

School. During the fall, the chairman of the Work Group, Thomas R. Mason, Planning Officer of the University of Colorado, wrote the Procedure Manual and designed the study procedures in consultation with the consultant and using the floor area standards recommended by the consultant. As each section of the Procedure Manual was completed, it was sent to each institution where members of the institution's staff began carrying out the procedures through a series of planning stages. This effort, completed in 1963, proved useful as a test of the efficacy of the general procedural methods. The Association subsequently asked the consultant to complete a revision of the Manual, prefatory to its final adoption as an official Association document.

This procedure, for the first time, will provide a uniform method of determining the capital outlay requirements of the institutions of higher education. Further revisions of the procedure will be made as experience indicates better ways. In the meantime, it will serve as a comprehensive basis for determining the need and merits of each individual building or other capital project, as well as the basis for a long-range capital funding program for higher education in Colorado.

REPORT TO
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APRIL 1964

TAYLOR, LIEBERFELD AND HELDMAN, INC.

PART I

INTRODUCTION

CHAPTER 1

CAMPUS DEVELOPMENT PROGRAMMING: A SYNOPTIC VIEW

A. Perspective

The burden of the Procedures Manual is to provide a basis for systematically programming the requirements for physical plant and land to accommodate the needs of an institution under a specified constellation of circumstances. As such, programming is distinct from design. Programming efforts need not be accompanied by architectural or landscaping design activities. Indeed, a properly prepared set of programming procedures can be used as a basis for evaluating a variety of assumptions in regard to physical planning criteria, institutional activity levels, educational planning assumptions, and so on, prior to the actual initiation of design studies.

Physical plant programming is not a new activity. In the strictest sense, all building and land use schemes are predicated upon a program of requirements that may be more or less fully articulated. However, in the sense used here, programming represents a systematic approach to the determination of physical plant and land requirements. It is an attempt to fill the vacuum in pre-design analysis which in the past has been filled by architects or their clients, as a rule inadequately.

In higher education, wide-spread efforts in the direction of more systematic physical plant programming have been made in recent years. The intensification of more systematic approaches to determining physical plant requirements have been a product of many influences, most notable, the recognition of the "rising tide" in college enrollments. In this connection, mention should be made of the early efforts of Russell, Doi, and other pioneers in this field.

The implementation of improved programming techniques has been most noticeable in publicly-supported institutions. The state-supported systems in California and New York may be cited as well-known pacemakers in this field. At the federal government level, the Department of Health, Education and Welfare until recently had given tentative encouragement to programming efforts, but had largely confined its own efforts to providing increased information resources concerning current practices across the broad spectrum of higher education. However, recent legislation passed by Congress, "The Higher Education Facilities Act of 1963", gives renewed emphasis to the significance of adequate programming and the establishment of criteria for determining requirements and priority of need. On the other hand, private institutions are less advanced in this regard. This is understandable. Private institutions can, to some extent, control the pressures on physical plant because they are in a position to make policy decisions setting upper limits to the levels of enrollment they will accommodate; public institutions must, in a relative sense, be open to all comers.

As a by-product of this situation, private institutions have tended to minimize the pressures of the "rising tide" by limiting their enrollments to levels that are consistent with their financial and physical plant resources. In consequence, pressure on public institutions has been growing throughout the entire post-World War II period. Whereas public institutions formerly accounted for less than half of all students enrolled in colleges and universities, the public sector now accounts for well over 60 percent of total enrollment and the proportion is increasing annually. The next several years will witness an intensification of this pressure upon the public institutions.

The proper assessment of the physical plant and land requirements of a college or university can be enhanced by consolidating into a single procedural outline the techniques for evaluating institutional activity levels and the techniques for converting such information into estimates of physical plant and land needs. Recognizing this, the Association of State Institutions of Higher Education in Colorado undertook the development of a Procedures Manual to be used by its member institutions in the development of a coordinated statement of capital requirements for campus development. To assist in this endeavor the Association retained Taylor, Lieberfeld and Heldman, Inc.[a] as consultants. The Manual of Procedures developed for the Association is noteworthy. It is the most comprehensive and sophisticated of the approaches currently being used among state-wide systems. It is a tool of the utmost value to administrators responsible for planning for the growth of their institutions and for providing a clear-cut demonstration of the implications of such growth for physical plant expansion and capital requirements.

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[a] The firm of Taylor, Lieberfeld and Heldman, Inc. was established at a time when increasing recognition was being given to the need for a more systematic approach to meeting the physical plant and land requirements of higher educational institutions. Since its inception, the firm has worked for colleges and universities across the United States and Canada. It has been called upon by public and private institutions, liberal arts colleges and multi-program institutions, specialized professional schools in medicine, engineering, pharmacy, and so on. Moreover, the firm's experience has not been limited solely to physical plant and campus planning. In order to function satisfactorily in these areas, the physical plant and campus programming studies have been augmented with research into the structural characteristics and socio-economic influences shaping the development of institutions of higher education.

A preliminary version of the Procedures Manual was developed during the 1962-63 academic year.[a] The members of the Association subsequently had an opportunity to work with various elements of the Manual and tested the viability of the methodology and validity of the criteria set forth therein. This edition of the Procedures Manual uses the first version as a foundation; it incorporates some additional material and includes revisions dictated by the need for certain technical corrections and simplification of some of the computational procedures.

The work of the consultants consisted of the following. First, suggestions were submitted at the beginning of the study concerning the general structural characteristics of the programming effort and the interrelationships among the various components of the Manual. Occasional comments critical of the Manual were submitted in the early stages of its development. Second, the consultants were responsible for providing the physical planning criteria; that is, the recommended square footage allocations for various functional categories of space to be programmed at the member institutions. The consultants then engaged in a two-fold task: a) a review of the Manual in its initial form, and b) an evaluation of the results of applying the methods outlined therein to the physical plant and campus development problems confronting each of the member institutions of the Association. Finally, the consultants were asked to prepare the revised version of the Manual which this volume represents.

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[a] It was prepared by Dr. Thomas R. Mason, now Director of Institutional Research and Planning at the University of Colorado.

B. Logical Structure

The Manual is organized in a building block pattern in which six broad elements are identifiable: 1) activity levels; 2) planning criteria; 3) space requirements; 4) building occupancy programs; 5) campus development-land requirements; and 6) capital budgeting. The accompanying diagram emphasizes the building block nature of the structure. Information concerning activity levels plus physical planning criteria yield estimates of space requirements; these in turn lead to a building occupancy program that specifies the use of existing facilities and the needs for new construction; this permits the articulation of a campus development program expressed in terms of land use; the last two elements are then convertible into a capital budget program for campus development. The feedback characteristics of the system are such that the final results in terms of capital outlay estimates, once computed, may suggest the desirability of re-evaluating the planning assumptions with regard to activity levels or any aspect of the six-component structure outlined above. A broader discussion of each of these elements follows.

1. Activity Levels

Colleges and universities typically are complex organisms. Institutional activity levels no longer may be defined solely in terms of enrollment. Instruction is only one aspect of the typical college or university scene; as such, it may be measured in terms of total enrollment, total hours of classroom and laboratory meetings, total student contact hours in such class meetings, and so on. However, it is increasingly the case that our higher educational institutions undertake externally-sponsored research activity and community service programs which generate substantial workloads. Accurate measurement of the activity level of an institution requires an assessment of all three of these broad activity areas and conversion of the results into carefully articulated and detailed statements of the structure of the student and staff populations and their activities. The student population must be classified by full-time - part-time status, by class year level, by program of study, and so on. The staff population must be classified by departmental affiliation and position category. Some of these estimates are in turn the result of institutional policy assumptions regarding such factors as semester credit hours and weekly clock hours of meeting to be associated with particular courses, student-faculty ratios and so on. It is only when the complex and multi-faceted structural characteristics of the institutional population have been so expressed that the planner may proceed to the next stage of programming.

2. Planning Criteria

The planning criteria appropriate to the programming effort fall into two broad classes. The first encompasses all criteria that deal with intensity or efficiency of utilization. Included are those criteria dealing with room utilization, student station utilization, single or multiple occupancy office use, turn-over factors in dining facilities, single or multiple occupancy in residential facilities, and so on. The second category reflects the physical aspect of planning more directly. It encompasses such factors as the square footage allocations per student station in classrooms or teaching laboratories, the areas to be assigned to private and/or multiple occupancy office stations, the number of volumes that can be housed per square foot of library stack space, the area requirement per dining station in family style dining halls, and so on. The physical planning criteria emphasize function and, as developed for this study, reflect human engineering considerations and an awareness of the state of present technology.

3. Space Requirements

Once having delineated the activity levels and planning criteria to be used in developing an institution's physical plant requirements, it is possible to estimate the amount of space needed to accommodate the projected activities. The resulting space program may be expressed in a variety of ways. For example, it is desirable to have estimates prepared on a departmental basis, indicating the amount of space required for academic departments such as English or Physics and non-academic departments such as the Registrar's Office and Food Services. It also is desirable to ascertain the amounts of space needed in specific functional categories, such as classrooms, teaching laboratories, offices, research facilities, library space, and so on. Finally, within each major functional category of space (such as office space) it is desirable to express the space needs in greater detail: primary areas, such as private offices or desk stations in multiple occupancy office facilities; and auxiliary service areas, such as supply rooms, file rooms, conference facilities, storage.

4. Building Occupancy Program

Upon completing the delineation of the space requirements of an institution in its various permutations, it is then possible to turn to the development of a building occupancy program: that is, the distribution of institutional space requirements among buildings, both existing [illegible] derived in step 3, outlined above. If there are no existing facilities to be used in the future, the estimate of total space required represents the amount that must be provided in new construction, and the problem of devising a building occupancy program reduces to one of organizing the distribution of these space requirements among new structures. If there are existing buildings and they are to be used in the future, the existing physical plant must be surveyed and the total amount of space available must be determined. The aggregate of existing space is then subtracted from the total projected space requirements; the resulting deficit represents a first approximation of the amount of space that must be provided in new construction. Of critical importance in programming is a careful statement of the departmental occupancy pattern, the building occupancy pattern and the cross-classification of the functional distribution of space within buildings and departments in existing structures and new buildings.

5. Campus Development: Land Requirements

The programming effort may now move to the evaluation of campus land requirements. Land requirements must be calculated for a number of subcomponents individually. Buildings represent one element of land use. Parking facilities, an increasingly important element in land use, represent another significant subject for analysis. Thorough consideration must be given to athletic facilities for physical education, intramural sports activities and intercollegiate programs.

To some extent, these land requirements [illegible]

pendence of the particular site upon which an institution is locat
But more typically, it is not possible to ignore design and environme
considerations entirely in the development of campus land requirement
The criteria appropriate to an urban setting are inappropriate to rur
settings. Similarly, the criteria appropriate to semi-tropical climat
conditions will be totally inappropriate to areas characterized by se
cold and snow conditions.

6. Capital Budgeting

Once the building occupancy pattern and campus development progr have been elaborated, appropriate cost criteria may be introduced for the evaluation of the capital outlay requirements that must accompany the implementation of the physical development program. Consideration must be given to the cost of altering existing buildings, costs of new construction, land acquisition, and a variety of other elements of capital outlay that may arise in the course of institutional development.

C. Policy Assumptions

The structuring of the programming model requires many assumptions that may be termed educational policy decisions. The level and distribution of enrollment, since these are affected by admissions policies, are examples of such policy planning assumptions. The length of the teaching week, the rate at which rooms should be utilized, faculty teaching loads and faculty-student ratios are other planning assumptions that must be decided at the policy-making level of an institution. In these matters, the programmer's role is limited to exploring the impact of the various assumptions that may be built into the programming model.[a]

Educational policy does not remain static, nor should it. Nor do the conditions underlying the programming considerations at any given instant of institutional development. The Manual provides a basis for a systematic evaluation and re-evaluation of the implications of alternate assumptions with regard to many aspects of institutional organization. The Manual permits development of a coordinated statement of physical plant and land needs for single elements of an institution, an entire institution and a group of several institutions when these are viewed together as a coordinated system. Furthermore, the Manual provides a basis for evaluating the budgetary implications of alternate planning assumptions and the consistency of decisions affecting both the operating and capital outlay sides of the financial picture. The programming system provides a powerful analytical tool for use in both short- and long-term planning of institutional development.

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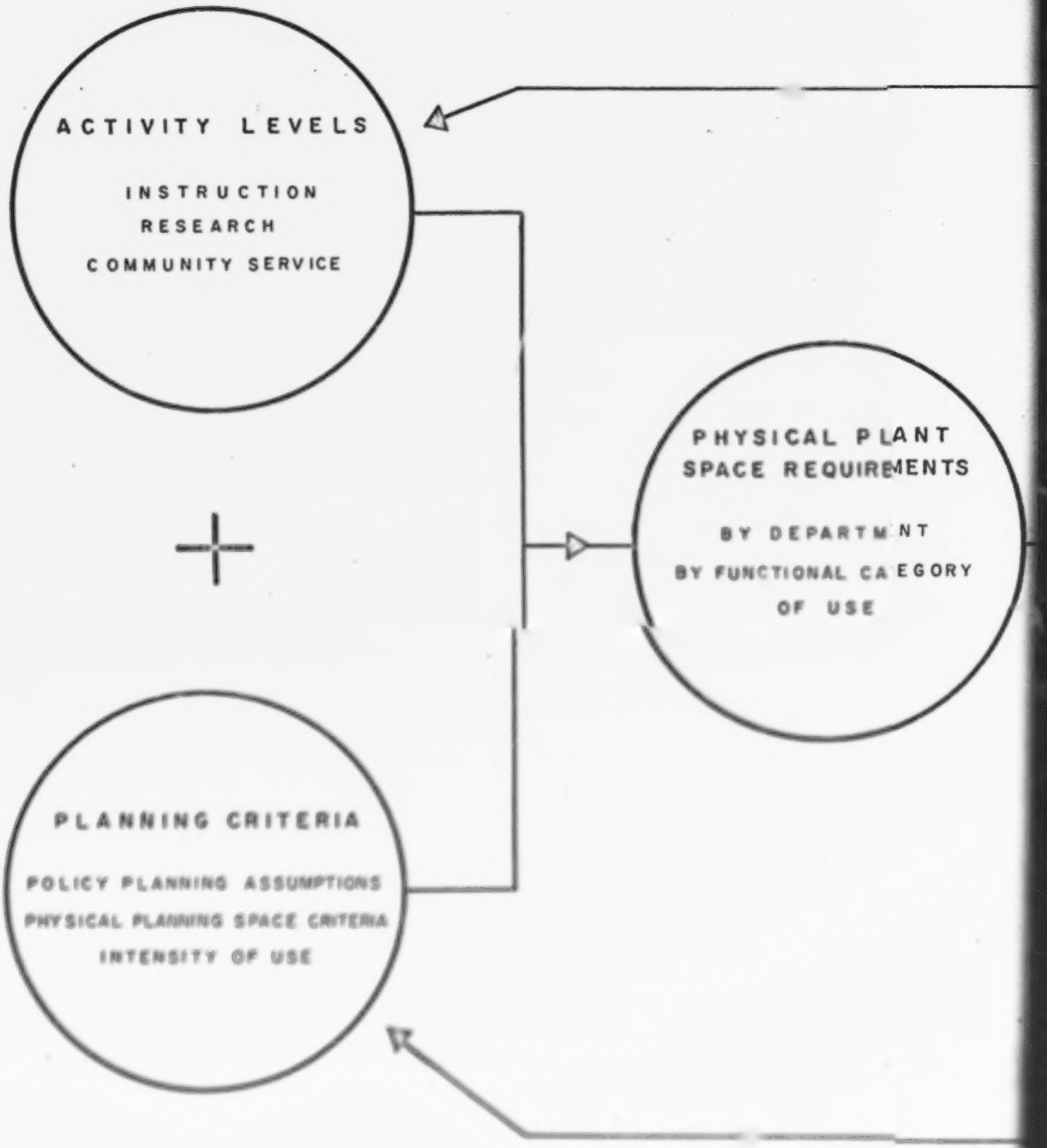
[a] It is recommended that the reader examine the questions listed in Appendix A for a quick insight into the range and scope of the policy considerations involved in the programming procedure.

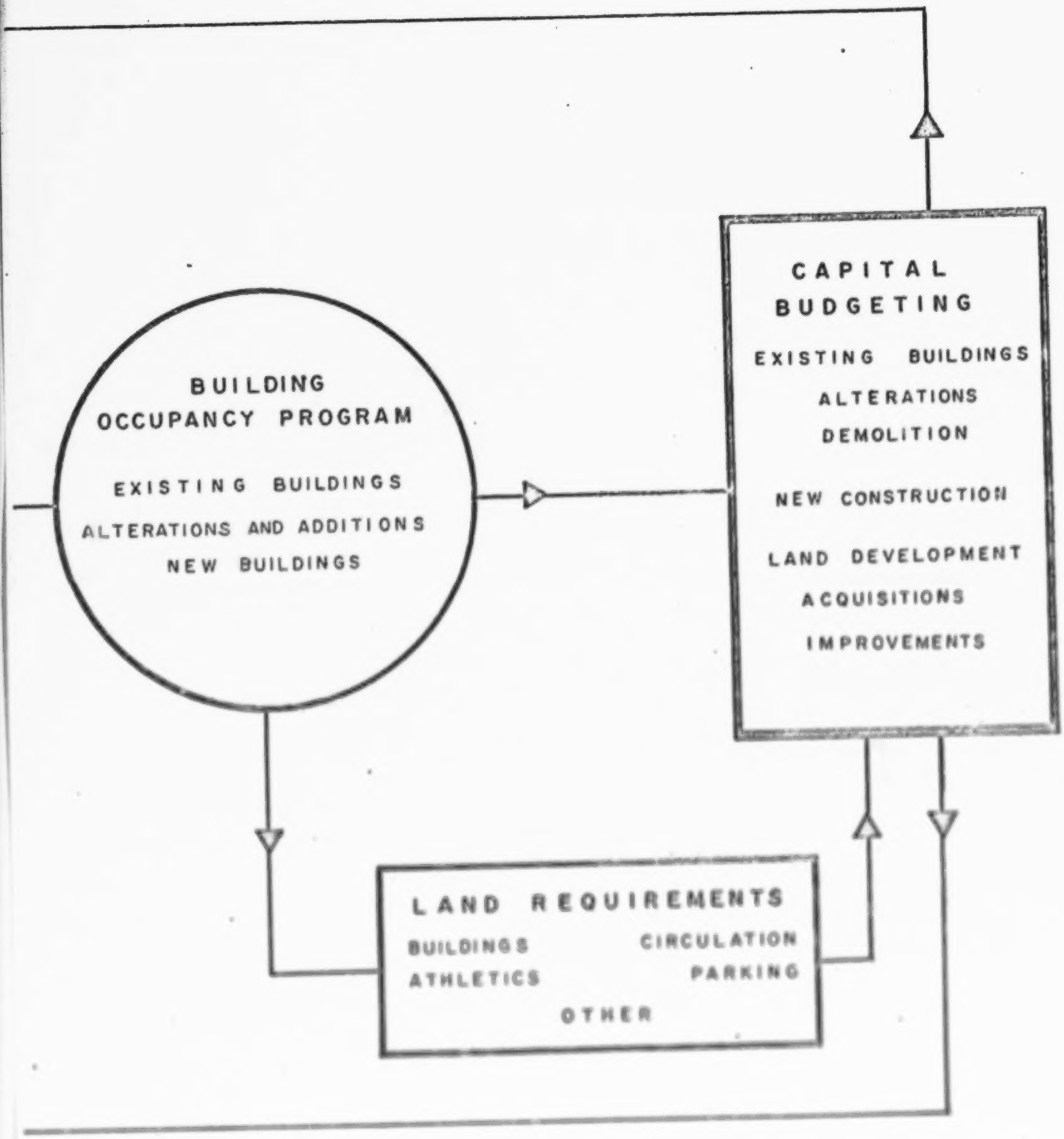
D. Organization of the Manual

The remainder of this volume is devoted to an exposition of the procedures and criteria appropriate to programming college and university campus development. Part II deals with various aspects of the determination and expression of institutional activity levels. Part III focuses upon the development of physical plant space requirements. In Part IV, consideration is given to the procedures for developing the building occupancy program and physical plant construction program. Part V deals with another physical aspect of campus development: land requirements. The final section of the Manual is concerned with the treatment of budgeting the campus development program.

PLATE I-1; CAMPUS
A GRAP


ACTIVITY LEVELS
INSTRUCTION
RESEARCH
COMMUNITY SERVICE
+
PLANNING CRITERIA
POLICY PLANNING ASSUMPTIONS
PHYSICAL PLANNING SPACE CRITERIA
INTENSITY OF USE
PHYSICAL PLANT SPACE REQUIREMENTS
BY DEPARTMENT
BY FUNCTIONAL CATEGORY OF USE

EVELOPMENT PROGRAMMING
C ANALYSIS


CAPITAL BUDGETING
EXISTING BUILDINGS
ALTERATIONS
DEMOLITION
NEW CONSTRUCTION
LAND DEVELOPMENT
ACQUISITIONS
IMPROVEMENTS
BUILDING OCCUPANCY PROGRAM
EXISTING BUILDINGS
ALTERATIONS AND ADDITIONS
NEW BUILDINGS
LAND REQUIREMENTS
BUILDINGS
CIRCULATION
ATHLETICS
PARKING
OTHER

PART II

ACTIVITY LEVELS

PART II

ACTIVITY LEVELS

Chapters 2 through 4 of the Manual are concerned with delineating key manifestations of activity at the college or university for which the campus development programming study is undertaken. As suggested earlier in the Introduction, institutional activity encompasses instructional programs, research and community service programs. In the final analysis, these activities are in part generated by the student and staff populations associated with an institution, and are in part a result of the number of persons in the student and staff categories at each institution.

In Chapter 2, the focus is on various aspects of student enrollment that are of relevance to the planning process. That is, for the several planning stages that may be considered, it will be necessary to have estimates of the number of students anticipated on both a head count and full-time equivalent basis, classified by residence or non-residence status, classified by sex and so on. The need for these various expressions of student enrollment will be clear as the Manual is developed.

In Chapter 3, the analysis of activity levels is carried a step further. A method is presented for combining estimates of projected enrollment with various assumptions with respect to curriculum content and the organization of instructional programs in order to produce estimates of the size and character of the instructional workloads that may be anticipated at an institution.

Chapter 4 proceeds to the analysis of staff requirements at the projected planning stages. The number of staff required is partly a function of the size and character of the instructional workloads already projected in Chapter 3, planning assumptions with respect to the typical workloads to be associated with various staff categories, and expectations with regard to the size and character of the non-instructional workloads that will be experienced at each institution. While no direct estimating procedures are provided for projecting research and/or community service workloads, it is assumed that the planning analyst at each institution will make such estimates and adjust the staffing patterns generated by the projection of instructional workloads accordingly. Thus, the overall staff requirement estimates should reflect the need for personnel to service all kinds of work and activity expected at each institution at each planning stage.

CHAPTER 2

ENROLLMENT

A. Student Population

Estimates of the potential student population at a college or university are a prerequisite to programming campus development. The size of instructional workloads, the number of faculty required and the physical plant and land requirements of an institution will clearly be a function of the size of the basic population group which the institution undertakes to service. Moreover, the characteristics of the projected student population must be expressed in such a way as to permit the projection of workloads and physical plant in their several manifestations on campus. Thus, instructional workloads are a function of the level and distribution of full-time equivalent enrollment. Parking facilities and dining facilities are partly related to the level of head count enrollment. The size and characteristics of the physical plant complex devoted to residential purposes are partly a function of the number of students in residence, their sex, and their distribution as between single and married status.

The significance of the planning assumptions underlying the various projections of enrollment is clear. The worksheets associated with this phase of the Manual are designed to permit the expression of these assumptions with regard to total enrollment and its classification among several relevant categories.

For purposes of this procedure, a full-time equivalent student is defined as follows. At the undergraduate level (lower and upper divisions), the FTE student load equals 15 student credit hours per term (30 semester s.c.h. per academic year, 45 quarter s.c.h. per academic year). At the graduate and graduate professional levels, an FTE student is defined as one fall term, on-campus graduate student registered for degree work. Subsequent differentiation can be made among students at various stages of graduate study.

In most Colorado institutions, fall term undergraduate head count enrollment closely approximates the total undergraduate level student credit hours divided by 30 semester s.c.h. or 45 quarter s.c.h. Therefore, total academic year undergraduate FTE enrollment usually will be close to fall term undergraduate head count. In institutions such as Colorado School of Mines, where heavier credit hour loads are required, or Southern Colorado State College, where substantial part-time enrollments are expected, this will not be the case. But these differences will not affect the basic measures of the statistical model.

In the future, appropriate data gathering methods should be instituted to permit the direct estimation of student clock hour loads from head count enrollment input. But in order to make use of the existing student credit hour data, gathered for the Association's "Class Size-Teaching Load" studies since 1955, the FTE concept is recommended for use in the procedure at this stage. Further, the FTE concept is well established in budget studies in Colorado and is a familiar term to legislators and state officials.

B. Planning Stages and Demographic Studies

For planning purposes, it is useful to develop projections of physical plant and land requirements which are independent of the passage of time and are a function of the level and characteristics of the workload to be accommodated on the campus. This is useful because demographic projections are subject to uncertainty and change. Furthermore, it is possible to combine subsequent analyses of demographic developments with the estimates of physical plant and land requirements at an institution and ultimately express campus development needs in terms of the time scale indicated by the demographic studies as appropriate to meeting these needs. In short, the procedure is so constructed that a series of planning stages, expressed in terms of full-time equivalent or head count enrollment for a given campus, is established. The actual dates at which these planning stages are to be reached may be determined after demographic enrollment projections are completed, and should reflect an analysis of the relationships between projected head count enrollment and FTE enrollment.

Demographic studies of the potential student population of Colorado colleges and universities have been prepared under the auspices of the Association of State Institutions of Higher Education in Colorado. In consultation with Dr. Carl Frisen of the California State Department of Finance, grade progression studies were carried out to determine probable numbers of high school graduates in the state. After determining the probable pressures of demand for college entrance upon existing institutions in the state over the next ten years, the head count enrollment estimates for each institution were developed by applying class progression ratios, adjusted for changing retention rates, transfer input, nonresident student admissions policy, and special conditions for limited professional programs and graduate level enrollments.

The statistical model outlined herein is semi-independent of the demographic student population projections. The model is adaptable to new enrollment projections as they are developed and subsequently revised. With this method, the traditional use of "high", "medium", and "low" enrollment projections to a given year is replaced by a system of determining whether an enrollment of, say, 3,000 FTE students will be reached in 1968, 1970 or 1972. In other words, a given stage of enrollment is fixed and the time scale is varied. When demographic enrollment estimates are updated, analysis of the relationships between head count and FTE enrollments will permit revision of the estimates of *when* the various planning stages may be reached.

From its current estimates of enrollment growth, each institution should establish a series of FTE enrollment levels covering the forthcoming ten-year period. Rounded figures may be used to express total FTE enrollment, with equal increments of 250, 500, 750, or 1,000 FTE students. The number of planning stages will vary from institution to institution. The first stage should approximate the FTE enrollment in the base year; the last stage should approximate the FTE enrollment expected ten years later. The intermediate stages are arbitrary increments of a given number which should be approximately related to the average rate of growth expected for a one- to two-year interval.

By way of example, the following stages may be established for various types of institutions:

Total Full-Time Equivalent Students

Planning Stage	Large Institution	Medium Institution	Small Institution
I	10,000	3,000	1,250
II	11,000	3,500	1,500
III	12,000	4,000	1,750
IV	13,000	4,500	2,000
V	14,000	5,000	2,250
VI	15,000	—	2,500
VII	16,000	—	2,750

The statistical model serves only to provide approximations of futu requirements. Therefore, little is gained by an undue effort at precis in the enrollment estimates. Moreover, the labor of calculation is considerably increased if too many stages are attempted. The capital budg to be derived from these estimates are generally accurate only within t first three years, in any case, and a building program can never reflec ideal annual growth increments. Not only will the building constructio program usually lag behind need, especially in the coming years of rapi growth, but individual buildings must be planned to accommodate future growth in the fields they serve. Therefore, the approximations of buil space requirements derived from the procedure are sufficiently accurate provide the basis for moving five-year capital budgets, yet sufficiently flexible to allow for unpredictable changes in rates and magnitudes of enrollment growth.

C. Outline of Procedure

This section of the Manual consists of five worksheets. Worksheet 2.1 permits the expression of the relationship between the demographic projections of enrollment and the planning stages that have been established for purposes of carrying out the campus programming study.

Worksheet 2.2 calls for the expression of enrollment classified by full-time equivalent and head count status and further sub-classified by level. Recent trends and institutional policy will permit determination of the distribution of enrollment by level; that is, lower division (freshman, sophomore), upper division (junior, senior), and graduate. The mix or distribution of enrollment by level should be related as carefully as possible to any institutional programs or policies affecting such distribution. At the graduate level, especially, the expected growth should be reviewed in relation to the program study of the Association's Task Force. This determination should therefore be made in consultation with the Task Force representatives, the chief academic officer of the institution, and the president.

Worksheet 2.3 permits the conversion of the enrollment data expressed in the preceding worksheet to indexes of growth relative to the base year enrollment levels in each category. These indexes will prove useful in subsequent stages of the analysis.

Worksheet 2.4 calls for the delineation of head count enrollment in several further sub-categories; classifications are provided by sex, by residential status, and by marital status. Worksheet 2.5 permits expression of the data in worksheet 7.4 in relative terms; that is, as indexes of growth relative to the base year level of enrollment in each category.

It should be remembered that the procedure called for is the construction of a statistical model of future development, not a precise projection of the past into the future. The determination of enrollment mix should therefore be made on the basis of institutional judgment, informed by recent trends, the objectives of the institution, the prospects of new programs, changes in institutional policy, and so on. A written statement describing the reasoning behind the determination of enrollment mix should be prepared and included as part of the technical note section of each table where this is relevant.

WORKSHEET 2.1; ENROLLMENT

Projected Planning Stages, Years in Which Planning Stages Are Expected, and Full-Time Equivalent and Head Count Enrollments

Institution____________________

	1	2	3	4	5	6	7
1	Planning stage	I	II	III	IV	V	V
2	Year specified planning stage is expected						
3	Enrollment:						
4	Full-time equivalent						
5	Head count						

DATA SOURCES:

All data are policy planning assumptions.

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

TECHNICAL NOTES:

WORKSHEET 2.2; ENROLLMENT

Distribution of Full-Time Equivalent and Head Count Enrollment at Selected Planning Stages, by Level

Institution____________________

Enrollment Category	Base Year: 196_-6_	Planning Stage					
		I	II	III	IV	V	VI
1	2	3	4	5	6	7	8
1 Full-time equivalent enrollment:							
2 Total							
3 Lower division							
4 Upper division							
5 Graduate							
6 Head count enrollment:							
7 Total							
8 Lower division							
9 Upper division							
10 Graduate							

DATA SOURCES: Col. 2 from institutional records. All other data are policy planning assumptions.

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 2.3: ENROLLMENT

Indexes of Growth in Full-Time Equivalent and Head Count Enrollment from Base Year to Selected Planning Stages, by Level

Institution______________________

	Enrollment Category 1	Base Year: 196_-6_ 2	Planning Stage I 3	II 4	III 5	IV 6	V 7	VI 8
1	Full-time equivalent enrollment:							
2	Total	1.000	____	____	____	____	____	____
3	Lower division	1.000	____	____	____	____	____	____
4	Upper division	1.000	____	____	____	____	____	____
5	Graduate	1.000	____	____	____	____	____	____
6	Head count enrollment:							
7	Total	1.000	____	____	____	____	____	____
8	Lower division	1.000	____	____	____	____	____	____
9	Upper division	1.000	____	____	____	____	____	____
10	Graduate	1.000	____	____	____	____	____	____

DATA SOURCES:

Col. 1: Worksheet 2.2
Col. 2: Computational assumption
Col. 3: Worksheet 2.2: Col 3 ÷ Col 2
Col. 4: Worksheet 2.2: Col 4 ÷ Col 2
Col. 5: Worksheet 2.2: Col 5 ÷ Col 2
Col. 6: Worksheet 2.2: Col 6 ÷ Col 2
Col. 7: Worksheet 2.2: Col 7 ÷ Col 2
Col. 8: Worksheet 2.2: Col 8 ÷ Col 2

PREPARED:
By______________
Date______________

APPROVED:
By______________
Date______________

SUBMITTED:
By______________
Date______________

576

WORKSHEET 2.4; ENROLLMENT

Distribution of Head Count Enrollment at Selected Planning Stages by Sex, Marital Status and Residence Category

Institution______________________

	Enrollment Category	Base Year: 196_-6_	Planning Stage I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Head count enrollment:							
2	Total							
3	Male							
4	Female							
5	Male, total							
6	Married							
7	Single							
8	Female, total							
9	Married							
10	Single							
11	Male, total							
12	In residence							
13	Married							
14	Single							
15	Commuters							

(Continued)

WORKSHEET 2.5 (Continued)

DATA SOURCES:

Col. 1: Worksheet 2.4
Col. 2: Computational assumption
Col. 3: Worksheet 2.4: Col. 3 ÷ Col. 2
Col. 4: Worksheet 2.4: Col. 4 ÷ Col. 2
Col. 5: Worksheet 2.4: Col. 5 ÷ Col. 2
Col. 6: Worksheet 2.4: Col. 6 ÷ Col. 2
Col. 7: Worksheet 2.4: Col. 7 ÷ Col. 2
Col. 8: Worksheet 2.4: Col. 8 ÷ Col. 2

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

[illegible]

20
17
16
10

CHAPTER 3

INSTRUCTIONAL WORKLOADS

A key step in the campus development programming study is forecasting the volume of instructional activity at the several planning stages under consideration. The size and character of projected instructional workloads will directly affect faculty and non-faculty staff requirements, the amount and composition of physical plant required, land requirements and the capital budget needed to implement the development program. This chapter focuses upon the technical procedures involved in converting the enrollment estimates presented earlier into instructional workload projections, detailed by department and course. Because of the nature of instructional organization, the analysis will extend in detail to the basic unit of instruction, the individual course offering. While this may generate considerable work in data processing, it is necessary to the adequate exploration of the basic expressions of academic policy and instructional workload.

A. Historical Developments and Subject Field Variations in Instructional Workloads

Colleges and universities are dynamic institutions. Programs of instruction and course offerings rarely remain static for very long periods of time. Not only does an institution modify the character of its offerings in order to provide better quality instruction and more closely meet the needs of the community it services, but students also express varying preferences for programs of study and subject field offerings from year to year. Nevertheless, historical data on the development of instructional

WORKSHEET 2.4 (Continued)

	Enrollment Category 1	Base Year: 196_-6_ 2	Planning Stage I 3	 II 4	 III 5	 IV 6	 V 7	 VI 8
16	Female, total							
17	In residence							
18	Married							
19	Single							
20	Commuters							

DATA SOURCES:

Col. 2 from institutional records. All other data are policy planning assumptions.

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

[illegible]

WORKSHEET 2.5; ENROLLMENT

Indexes of Growth in Head Count Enrollment from Base Year to Selected Planning Stages, by Sex, Marital Status and Residence Category

Institution____

	Enrollment Category	Base Year: 196_-6_	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Head count Enrollment:							
2	Total	1.000						
3	Male	1.000						
4	Female	1.000						
5	Male, total	1.000						
6	Married	1.000						
7	Single	1.000						
8	Female, total	1.000						
9	Married	1.000						
10	Single	1.000						
11	Male, total	1.000						
12	In residence	1.000						
13	Married	1.000						
14	Single	1.000						
15	Commuters	1.000						
16	Female, total	1.000						
17	In residence	1.000						
18	Married	1.000						
19	Single	1.000						
20	Commuters	1.000						

(Continued)

workloads are an indication of the relative strength of particular subject field offerings as well as underlying trends in student preferences.

The first four worksheets in this chapter are designed to provide a basis for analyzing historical patterns in the distribution of instructional workloads. The historical analysis is conducted on two levels of detail: by subject field; and by course level (lower division, upper division or graduate). Workloads may be expressed in terms of student credit hours, full-time equivalent enrollment or head count number of course registrants; the planning analyst must designate the particular form in which the workloads are expressed. However, it should be noted that the last of these measures, head count number of course registrants, is the preferred basis for expressing instructional workloads if the data should be directly available.

Worksheet 3.1 provides for the identification of instructional workloads by subject field and course level for the past six years. These are the raw data upon which the subsequent analysis is based. Worksheet 3.2 permits the planning analyst to adjust the historical data by eliminating material which may be irrelevant for future planning or adding workload data relating to subject field offerings that may not be included in the historical data. Thus, the basic data can be adjusted so that they are consistent with the scope of offerings anticipated during the planning interval under consideration.

Worksheet 3.3 calls for the analyst to weight the historical distribution of instructional workloads so that the recent years are given relatively greater prominence in the evaluation of shifts in student preferences and curriculum content over time. The weighted distribution contributes to a more reasonable evaluation of the significance of shifts in the distribution of instructional workloads by subject field, giving weight to recent experience without allowing basic curriculum stability to be overshadowed by recent trends.

In worksheet 3.4, a technique is suggested for measuring the shifting pattern of preferences in subject field offerings over the historical period being considered. The resulting measure is designated as the index of trend variance. The index measures in relative terms the extent to which components of total instructional workload vary from the trend characterizing the total; that is, changes in the instructional workloads in individual subject fields relative to changes in the overall workload level of the entire institution. The index thus has a value greater than 1,000 in subject fields experiencing more rapid growth in instructional workload than the average for all subject fields, a value of less than 1,000 where the opposite situation prevails, and a value equal to 1,000 in subject fields in which instructional workloads are just keeping pace with changes in the overall workload level. However, the extreme values that might be generated solely by trend analysis are avoided. Where instructional workloads are increasing more rapidly than the average for the entire institution, the index of trend variance is greater than 1.000 but less than it would be if the weighted average system were not used. The rationale for computing the index of trend variance is explained in the following section.

B. Projection of Instructional Workloads: Course Participation Levels

The procedure now shifts to the projection of future instructional workloads in each subject field. But before explaining methodology, a comment is in order regarding the general logic of the projection procedure.

Consider the instructional workload represented by any given course. In the base year, the instructional workload associated with the course can be measured in terms of full-time equivalent students, credit hours generated, or head count number of course registrants. In turn, participants in the course may be described as lower division, upper division or graduate level students. Clearly, growth in these enrollment categories will directly affect the absolute and relative amounts of increase that may be anticipated in the number of students taking the course under consideration at each planning stage. The programming procedure has already called for a projection of the expected growth in full-time equivalent enrollment at each of these levels (see Chapter 2). This information is significant since growth in registrations or instructional workloads in a particular course should certainly reflect the combined influence of the growth patterns characterizing the several classes of students registered in the course in the base period (and who may be expected to take the course in the future).

In a static world in which student preferences did not change and curriculum offerings were constant, enrollment change would be the only influence affecting course workload, as measured in terms of number of participants. Only variations in the patterns of enrollment change anticipated for the several student groups taking a course would produce a shift in workload other than proportionate to the change in total enrollment.

However, student preferences do change and curriculum structure is not static. For these reasons, the estimating procedure must incorporate a variable to take account of this modifying influence. The measure developed for this purpose has been designated the index of trend variance. As described above, the index measures the relative deviation from the over-all pattern of expansion that may be expected in a particular subject field and course group within the subject field. The index incorporates recent trends in the relative drawing power of various subject fields; it is thus a reasonable basis for modifying the simple growth factor describing the changes expected in the three enrollment groups from which the students taking a course are drawn. Taken together, the index of growth in enrollment and the index of trend variance in subject field course offerings provide a composite index of expansion that will reflect expected changes in the two broad influences affecting course workload: a) changes in enrollment, and b) shifts in student preferences and/or curriculum structure as indicated by recent trends.

Worksheet 3.5 provides the technical format for implementing the method described above. The worksheet implies that the estimating procedure should be carried out at the level of detail associated with a course-by-course analysis. This may involve extensive demands for calculating time. Yet, a course-by-course analysis is essential to estimating the total workloads that can be expected in each subject field, the implicit faculty requirements generated by these workloads, and the various forms of instructional and non-instructional space that will be needed to service these loads.[a]

Following is an example of the procedure. The illustration demonstrates the mechanics of projecting the instructional workload in a course which has students registered from different enrollment groups.

Illustrative Program for Projection of Instructional Workloads at Specified Planning Stage, by Subject Field, Course and Level of Student Registrants

Institution: State College Subject Field: Chemistry Course Level: Lower Division Planning Stage: III

Course Number 1	Level of Student Registrants 2	Instructional Workload: Base Year 3	Index of Growth: Enrollment 4	Index of Trend Variance 5	Composite Index of Expansion 6	Instructional Workload: Target Planning Period 7
15	Lower	155	1.300	1.010	1.313	204
	Upper	40	1.410	1.010	1.424	57
	Graduate	10	2.450	1.010	2.475	25
	Total	205	--	--	--	286

Col. 1: Institutional records
Col. 2: Institutional records
Col. 3: Institutional records
Col. 4: Worksheet 2.3
Col. 5: Worksheet series 3.4
Col. 6: Col. 4 x Col. 5
Col. 7: Col. 3 x Col. 6

N.B.
1) Total instructional workload at target period is obtained by aggregating projected Lower, Upper and Graduate participation.
2) Instructional workload is expressed as head count number of course registrants.

---

[a] In column 2 of worksheet 3.5, the level of student registrants refers to the enrollment group from which the students participating in a particular course are drawn. Thus, there may be twenty students from the lower division, ten students from the upper division status, and one student who has graduate status. On the other hand, the index of trend variance in column 5 is associated with the course level of the course being offered. As such, the index of trend variance does not change with the level of student registrants. Rather, the index of trend variance changes only with shifts in the course level at which the particular course is offered; i.e., from lower division to upper division or graduate level.

C. Policy Assumptions Concerning the Organization of Instruction

The data on instructional workload, as measured by student registrations, are in themselves useful. But various other objectives require the expression of instructional workload in different form. In particular, these data may in turn be transformed into corollary estimates of the number of clock hours of meetings per week or the number of meeting groups per week. This requires certain policy planning assumptions concerning the structure of curriculum offerings and the organization of instruction in these courses. Worksheet 3.6 may be used for systematically recording these assumptions. The program of course offerings in each subject field should be enumerated, together with the planning assumptions regarding the credit hour value per student, the number of clock hours of meeting per week in various types of classroom or special purpose instructional facilities, and the preferred sizes for meeting groups in these facilities. The last may be developed by direct consultation with administrative heads of the various subject fields.

Worksheet 3.7 specifies additional policy planning assumptions which show the basis for converting from the original workload projections to appropriate corollary expressions of instructional workload. Definitions are provided for the transformation relationships among three forms for expressing instructional workload: student credit hours, full-time equivalent enrollment, and head count number of course registrants.

Worksheet 3.8 carries the analysis through the conversion of the instructional workload projections prepared in worksheet 3.5 to the desired corollary expressions. Three measures of instructional workload at each target planning period thus will be available for each course. It should be noted that the programming procedure as outlined later in the Manual only requires that data be developed in terms of head count number of course registrants. Thus, completion of this worksheet may not be necessary if the analysis in worksheet 3.5 has already been carried out in terms of course registrations. The corollary expressions, FTE enrollment or student credit hours, however, may be found useful for other purposes.

D. Projection of Instructional Workloads by Type of Facility Required and Class Size

It is of critical importance to subsequent projections of the requirements for scheduled instructional space that projected instructional workloads ultimately be expressed in terms of type and capacity of facility required. The remaining worksheets in this chapter are to be used for this purpose. The analyses covered by worksheets 3.9 through 3.12 are primarily manipulations of the data already developed.

Worksheet 3.9 focuses upon the class and student periods of instruction associated with each course. The worksheet draws upon data developed earlier for each course: i.e., the projected number of course registrants; and the policy planning assumptions regarding the preferred class sizes and clock hours of meeting per week in each type of meeting facility. These data are then combined to obtain estimates of the total class hours and student periods per week in various kinds of classroom and special purpose instructional facilities.

Worksheet 3.10 summarizes the projections of class hours and student periods per week in each subject field at the specified planning stage. Worksheet 3.11 summarizes the development of projected class hour and student period workloads in the specified subject field over the entire planning interval. In both worksheets, the data are classified by type of instructional facility. Finally, worksheet 3.12 calls for an analysis of the size distribution of projected group meetings by subject field for the specified planning stage and type of facility. These several classifications of instructional workload are similar to some of the material contained in the "Class Size-Teaching Load" studies conducted by the Association.

The worksheets contain sufficient technical material to permit the analyst to move through the successive stages of analysis without difficulty. Institutions may vary in the extent to which underlying data are available for the detailed analysis outlined in this chapter. It will be in the long-range interests of the institutions if future data gathering reflects the needs implicit in the above exposition.

The lack of the historical student credit hour data for Southern Colorado State College and the change to the trimester degree program at Fort Lewis, of course, prevent the direct application of the foregoing procedures by these institutions.

It will be necessary for these institutions to develop constructs of their prospective student load distributions by analysis of their curriculum plans and assumptions about student input and course choices. In these cases, the direct estimation of instructional workloads may be made by means of a complex statistical model.

The progression of students through the complete degree programs offered by the institutions requires elaboration of the model through the entire sequence of choices. If this type of analysis can be carried out, the basis for a comprehensive institutional plan is at hand. The completed model may serve to predict building space and other physical plant requirements, faculty and staff requirements, the effects of program changes, and the like from a given student input and a given set of assumptions about student choices.

A complex model of this sort may be developed in the future for other existing institutions, but for larger, on-going institutions such data can only be handled on large-scale computers and then only after much further study of the multitude of variables at work in each institution. The institutions planning new degree programs should, if possible, introduce this system at the outset when student input into the degree programs will be starting and when planning can be based upon rational assumptions linked to the goals and objectives of the institutions.

WORKSHEET 3.1; INSTRUCTIONAL WORKLOADS

Historical Distribution of Instructional Workloads by
Subject Field and Course Level, 19__ to 19__

Institution________________ Course Level[b]________________

	Subject Field	Instructional Workload[a]					
		1959-60	1960-61	1961-62	1962-63	1963-64	1964-65
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	Total						

(Continued)

WORKSHEET 3.1 (Continued)

DATA SOURCES: All data are from institutional records and/or "Class Size-Teaching Load reports. See Appendix B for Subject Field classification system.

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Specify whether workloads are expressed as a) student credit hours, b) FTE enrollmen or c) head count number of course registrants.

[b] Worksheet 3.1.1: Lower division
Worksheet 3.1.2: Upper division
Worksheet 3.1.3: Graduate
Worksheet 3.1.4: All levels

WORKSHEET 3.2; INSTRUCTIONAL WORKLOADS

Adjustment of Total and Distribution of Instructional Workloads for Purposes of Computing Distributional Pattern to Be Used as Planning Assumptions at Projected Enrollment Targets, by Subject Field and Course Level, 19__ to 19__

Institution________________ Course Level[b]________________

	Subject Field	Instructional Workload[a]					
		1959-60	1960-61	1961-62	1962-63	1963-64	1964-65
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	Total						

(Continued)

WORKSHEET 3.2 (Continued)

DATA SOURCES: All data are from Worksheet 3.1, modified wherever appropriate by the analyst preparing the report.

PREPARED:	APPROVED:	SUBMITTED:
By____________________	By____________________	By____________
Date____________________	Date____________________	Date____________

TECHNICAL NOTES:

[a] Specify whether workloads are expressed as a) student credit hours, b)FTE enrollment, or c) head count number of course registrants.

[b] Worksheet 3.2.1: Lower division
Worksheet 3.2.2: Upper division
Worksheet 3.2.3: Graduate
Worksheet 3.2.4: All levels

WORKSHEET 3.3; INSTRUCTIONAL WORKLOADS

Historical Distribution of Instructional Workloads, Unweighted and Weighted, by Subject Field and Course Level, 19__ to 19__

Institution ______________________ Subject Field or Department[b] ______________________

			Instructional Workload[a]							
			Lower Division		Upper Division		Graduate		All Levels	
	Year 1	Weight 2	Unweighted 3	Weighted 4	Unweighted 5	Weighted 6	Unweighted 7	Weighted 8	Unweighted 9	Weighted 10
1	1959-60	1								
2	1960-61	2								
3	1961-62	3								
4	1962-63	4								
5	1963-64	5								
6	1964-65	6								
7	Total									

N.B. This worksheet can be omitted if computations are made on a desk calculator with an accumulating multiplier.

DATA SOURCES:

Col. 1: Institutional records
Col. 2: Policy planning assumption
Col. 3: Worksheet 3.2
Col. 4: Col. 3 x Col. 2
Col. 5: Worksheet 3.2
Col. 6: Col. 5 x Col. 2
Col. 7: Worksheet 3.2
Col. 8: Col. 7 x Col. 2
Col. 9: Worksheet 3.2
Col. 10: Col. 9 x Col. 2

(Continued)

WORKSHEET 3.3 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By______________	By______________	By______________
Date______________	Date______________	Date______________

TECHNICAL NOTES:

[a] Specify whether workloads are expressed as a) student credit hours, b) FTE enrollment, or c) head count number of course registrants.

[b] One worksheet per subject field is required. Worksheets should be numbered in series; e.g., 3.3.1, 3.3.2, ... 3.3.n.

WORKSHEET 3.4; INSTRUCTIONAL WORKLOADS

Computation of Index of Trend Variance, by Subject Field and Course Level

Institution ______________ Course Level[b] ______________

		Instructional Workload[a]					
		Number		Percent		Index of Trend Variance: $\Sigma=1.000$	
	Subject Field	Unweighted (S)	Weighted (S_W)	Unweighted $P=S/\Sigma S$	Weighted ($P_W=S_W/\Sigma S_W$)	Unadjusted ($T=P_W/P$)	Adjusted (T')
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

(Continued)

WORKSHEET 3.4 (Continued)

		Instructional Workload[a]					
		Number		Percent		Index of Trend Variance: $\sum=1.000$	
	Subject Field	Unweighted (S)	Weighted (S_W)	Unweighted $P=S/\sum S$	Weighted ($P_W=S_W/\sum S_W$)	Unadjusted ($T=P_W/P$)	Adjusted (T')
	1	2	3	4	5	6	7
12							
13							
14							
15							
16	Total			100.00	100.00	1.000	1.000

DATA SOURCES:

Col. 1: Worksheet 3.3
Col. 2: Worksheet 3.3
Col. 3: Worksheet 3.3
Col. 4: Col. 2: $S \div \sum S$
Col. 5: Col. 3: $S_W \div \sum S_W$
Col. 6: Col. 5 ÷ Col. 4
Col. 7: Col. 6 as adjusted by analyst preparing report

PREPARED:	APPROVED:	SUBMITTED:
By________	By________	By________
Date________	Date________	Date________

TECHNICAL NOTES:

[a] Specify whether workloads are expressed as a) student credit hours, b) FTE enrollment, or c) head count number of course registrants.

[b] Worksheet 3.4.1: Lower division
Worksheet 3.4.2: Upper division
Worksheet 3.4.3: Graduate
Worksheet 3.4.4: All levels

WORKSHEET 3.5; INSTRUCTIONAL WORKLOADS

Projection of Instructional Workloads at Specified Planning Stage, by Subject Field, Course and Level of Student Registrants

Institution __________ Subject Field or Department __________ Course Level[b] __________ Planning Stage __________

	Course Number 1	Level of Student Registrants 2	Instructional Workload:[a] Base Year[c] 3	Index of Growth: Enrollment 4	Index of Trend Variance[d] 5	Composite Index of Expansion 6	Instructional Workload:[a] Target Planning Period 7
1		Lower					
2		Upper					
3		Graduate					
4		Total					
5		Lower					
6		Upper					
7		Graduate					
8		Total					
9		Lower					
10		Upper					
11		Graduate					
12		Total					

(Continued)

WORKSHEET 3.5 (Continued)

DATA SOURCES:

Col. 1: Institutional records
Col. 2: Institutional records
Col. 3: Institutional records
Col. 4: Worksheet 2.3
Col. 5: Worksheet series 3.4
Col. 6: Col. 4 x Col. 5
Col. 7: Col. 3 x Col. 6

PREPARED:
By ____________________
Date ____________________

APPROVED:
By ____________________
Date ____________________

SUBMITTED:
By ____________________
Date ____________________

TECHNICAL NOTES:

[a] Specify whether workloads are expressed as a) student credit hours, b) FTE enrollment, or c) head count number of course registrants.

[b] Worksheet 3.5.1: Lower division courses
Worksheet 3.5.2: Upper division courses
Worksheet 3.5.3: Graduate courses

[c] Base year is most recent year for which data are available; e.g., 1964-65.

[d] The index of trend variance should not be used when projecting participation levels in courses required of all students, since variations in student preferences are not relevant and the only operative influence is enrollment variation.

WORKSHEET 3.6; INSTRUCTIONAL WORKLOADS

Policy Planning Assumptions for Workload Characteristics of Individual Course Offerings, by Subject Field, Course and Type of Meeting

nstitution________________________ Subject Field or Department____________

____

			Clock Hours of Meeting Per Week[c]				
			In Classroom-Type Facilities			In Special Purpose Instructional Facilities (Laboratory, Studio, Shop)	
			Lecture		Seminar, Recitation or Discussion		
	Course Number 1	Credit Hour Value per Student 2	Auditorium or Lecture Hall 3	Regular Classroom 4	5	6	Other 7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

(Continued)

WORKSHEET 3.6 (Continued)

Course Level[a] ____________________ Planning Stage[b] ____________________

____

	Preferred Maximum Sizes of Meeting Groups[d]				
	In Classroom-Type Facilities			In Special Purpose Instructional Facilities (Laboratory, Studio, Shop)	
	Lecture				
	Auditorium or Lecture Hall 8	Regular Classroom 9	Seminar, Recitation or Discussion 10	11	Other 12
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

(Continued)

WORKSHEET 3.6 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 3.5
Col. 2: Institutional records and/or policy planning assumption
Col. 3: Institutional records and/or policy planning assumption
Col. 4: Institutional records and/or policy planning assumption
Col. 5: Institutional records and/or policy planning assumption
Col. 6: Institutional records and/or policy planning assumption
Col. 7: Institutional records and/or policy planning assumption
Col. 8: Survey of department chairmen and/or policy planning assumption
Col. 9: Survey of department chairmen and/or policy planning assumption
Col. 10: Survey of department chairmen and/or policy planning assumption
Col. 11: Survey of department chairmen and/or policy planning assumption
Col. 12: Survey of department chairmen and/or policy planning assumption

---

PREPARED:
By________________
Date______________

APPROVED:
By________________
Date______________

SUBMITTED:
By____________
Date__________

TECHNICAL NOTES:

[a] Worksheet 3.6.1: Lower division courses
3.6.2: Upper division courses
3.6.3: Graduate courses

[b] This may be superfluous, unless there is some cogent reason for staging in the specification of the various planning assumptions.

[c] Number of hours.

[d] Number of students.

WORKSHEET 3.7; INSTRUCTIONAL WORKLOADS

Policy Planning Assumptions for Converting Expression of Projected Instructional Workloads to Selected Alternate Forms

Institution__________ Subject Field or Department__________ Planning Stage__________

	Conversion Relationship			Required Calculation		
	Code Designation 1	From 2	To 3	Variable 4	Process 5	Variable 6
1	A	Student credit hours	Full-time equivalent enrollment	Projected student credit hours	÷	Credit hour load of full-time equivalent student
2	B	Student credit hours	Head count number of course registrants	Projected student credit hours	÷	Credit hour value of course per course registrant
3	C	Full-time equivalent enrollment	Student credit hours	Projected full-time equivalent enrollment	x	Credit hour load of full-time equivalent student
4	D	Full-time equivalent enrollment	Head count number of course registrants	Projected full-time equivalent enrollment	x	Ratio: credit hour load of full-time equivalent student to credit hour value of course per course registrant
5	E	Head count number of course registrants	Student credit hours	Projected head count number of course registrants	x	Credit hour value of course per course registrant

(Continued)

WORKSHEET 3.7 (Continued)

	Conversion Relationship			Required Calculation		
	Code Designation	From	To	Variable	Process	Variable
	1	2	3	4	5	6
6	F	Head count number of course registrants	Full-time equivalent enrollment	Projected head count number of course registrants	÷	Ratio: credit hour load of full-time equivalent student to credit hour value of course per course registrant

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

WORKSHEET 3.8; INSTRUCTIONAL WORKLOADS

Expression of Projected Instructional Workloads at Specified Planning Stage in Terms of Student Credit Hours, Full-Time Equivalent Enrollments and Head Count Number of Course Registrants, by Subject Field and Course

Institution__________ Subject Field or Department__________ Course Level[a]________ Planning Stage__________

	Course Number	Instructional Workloads, Target Planning Period		
		Student Credit Hours	Full-Time Equivalent Enrollment	Head Count Number of Course Registrants
	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15	Total			

(Continued)

WORKSHEET 3.8 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 3.5

Alternates

Assume data in Col. 7 of worksheet series 3.5 are expressed as

	A	B	C
	Student Credit Hours, then	Full-Time Equivalent Enrollment, then	Head Count Number of Course Registrants, then
Col. 2:	Worksheet series 3.5	Calculate by using data in Col. 3 and relation C in worksheet 3.7	Calculate by using data in Col. 4 and relation E in worksheet 3.7
Col. 3:	Calculate by using data in Col. 2 and relation A in worksheet 3.7	Worksheet series 3.5	Calculate by using data in Col. 2 and relation A in worksheet 3.7
Col. 4:	Calculate by using data in Col. 3 and relation D in worksheet 3.7	Calculate by using data in Col. 3 and relation D in worksheet 3.7	Worksheet series 3.5

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a]Worksheet 3.8.1: Lower division courses
3.8.2: Upper division courses
3.8.3: Graduate courses
3.8.4: All levels

WORKSHEET 3.9; INSTRUCTIONAL WORKLOADS

Expression of Projected Instructional Workloads at Specified Planning Stage in Terms of Number of Meeting Groups per Week, Clock Hours of Class Meetings per Week, and Number of Student Periods of Meeting per Week, by Subject Field, Course and Type of Meeting

Institution__________ Subject Field or Department__________ Course Level[a]__________ Planning Stage__________

	Item	Course Number					
							Total
	1	2	3	4	5	6	7
1	Number of course registrants						
2	Preferred maximum size of meeting groups:						
3	In classroom-type facilities:[b] A						
4	B						
5	C						
6	In special purpose instructional facilities						
7	Other						
8	Clock hours of meeting per week:						
9	In classroom-type facilities:[b] A						
10	B						
11	C						

(Continued)

WORKSHEET 3.9 (Continued)

	Item	Course Number					
							Total
	1	2	3	4	5	6	7
12	In special purpose instructional facilities						
13	Other						
14	Number of meeting groups per week:						
15	In classroom-type facilities:[b] A						
16	B						
17	C						
18	In special purpose instructional facilities						
19	Other						
20	Number of clock hours of class meetings per week:						
21	In classroom-type facilities:[b] A						
22	B						
23	C						
24	In special purpose instructional facilities						
25	Other						

(Continued)

WORKSHEET 3.9 (Continued)

	Item	Course Number					
	1	2	3	4	5	6	Total 7
26	Number of student periods of meeting per week:						
27	In classroom-type facilities:[b] A						
28	B						
29	C						
30	In special purpose instructional facilities						
31	Other						

DATA SOURCES:

Course Numbers: Worksheet series 3.8, Col. 1
Line 1: Worksheet series 3.8, Col. 4
Line 3: Worksheet series 3.6
Line 4: Worksheet series 3.6
Line 5: Worksheet series 3.6
Line 6: Worksheet series 3.6
Line 7: Worksheet series 3.6
Line 9: Worksheet series 3.6
Line 10: Worksheet series 3.6
Line 11: Worksheet series 3.6
Line 12: Worksheet series 3.6
Line 13: Worksheet series 3.6
Line 15: If there is an entry on line 9, then line 1 ÷ line 3
Line 16: If there is an entry on line 10, then line 1 ÷ line 4
Line 17: If there in an entry on line 11, then line 1 ÷ line 5
Line 18: If there is an entry on line 12, then line 1 ÷ line 6
Line 19: If there is an entry on line 13, then line 1 ÷ line 7
Line 21: Line 9 x line 15
Line 22: Line 10 x line 16
Line 23: Line 11 x line 17
Line 24: Line 12 x line 18
Line 25: Line 13 x line 19
Line 27: Line 1 x line 9
Line 28: Line 1 x line 10
Line 29: Line 1 x line 11
Line 30: Line 1 x line 12
Line 31: Line 1 x line 13

(Continued)

WORKSHEET 3.9 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Worksheet 3.9.1: Lower division courses
3.9.2: Upper division courses
3.9.3: Graduate courses

[b] A stands for auditorium or lecture hall
B stands for regular classroom
C stands for seminar, recitation or discussion

WORKSHEET 3.10; INSTRUCTIONAL WORKLOADS

Summary of Projected Instructional Workloads at Specified Planning Stage, in Terms of Clock Hours of Class Meetings and Student Periods of Meeting per Week, by Department and Type of Meeting

Institution________________ Course Level[a]________________

		Instructional Workload				
		Clock Hours of Class Meetings per Week				
		In Classroom-Type Facilities			In Special Purpose Instructional Facilities (Laboratory, Studio, Shop)	
		Lecture				
	Subject Field or Department	Auditorium or Lecture Hall	Regular Classroom	Seminar, Recitation or Discussion		Other
	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10	Total					

DATA SOURCES:

All data are from worksheet series 3.9.

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

(Continued)

WORKSHEET 3.10 (Continued)

Planning Stage____________________

	Instructional Workload				
	Student Periods of Meetings per Week				
	In Classroom-Type Facilities			In Special Purpose Instructional Facilities (Laboratory, Studio, Shop)	
	Lecture				
	Auditorium or Lecture Hall	Regular Classroom	Seminar, Recitation or Discussion		Other
	7	8	9	10	11
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

TECHNICAL NOTES:

[a]Worksheet 3.10.1: Lower division
3.10.2: Upper division
3.10.3: Graduate
3.10.4: All levels

WORKSHEET 3.11; INSTRUCTIONAL WORKLOADS

Summary of Projected Instructional Workloads in Terms of Aggregate Clock Hours of Class Meetings and Aggregate Student Periods of Meeting per Week, by Type of Meeting and Planning Stage

Institution__________ Subject Field or Department[a]__________ Course Level All

	Workload Category and Type of Facility Required	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Instructional workload:						
2	Clock hours of class meetings per week:						
3	In classroom-type facilities:						
4	Auditorium or lecture hall						
5	Regular classroom						
6	Seminar, recitation or discussion						
7	Subtotal						
8	In special purpose instructional facilities						
9	Other						
10	Total						
11	Student periods of meeting per week:						
12	In classroom-type facilities:						
13	Auditorium or lecture hall						
14	Regular classroom						
15	Seminar, recitation or discussion						
16	Subtotal						

(Continued)

WORKSHEET 3.11 (Continued)

	Workload Category and Type of Facility Required	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
17	In special purpose instructional facilities						
18	Other						
19	Total						

DATA SOURCES:

Line 4: Worksheet series 3.10.4, Col. 2
Line 5: Worksheet series 3.10.4, Col. 3
Line 6: Worksheet series 3.10.4, Col. 4
Line 7: Line 4 + line 5 + line 6
Line 8: Worksheet series 3.10.4, Col. 5
Line 9: Worksheet series 3.10.4, Col. 6
Line 10: Line 7 + line 8 + line 9
Line 13: Worksheet series 3.10.4, Col. 7
Line 14: Worksheet series 3.10.4, Col. 8
Line 15: Worksheet series 3.10.4, Col. 9
Line 16: Line 12 + line 13 + line 14
Line 17: Worksheet series 3.10.4, Col. 10
Line 18: Worksheet series 3.10.4, Col. 11
Line 19: Line 16 + line 17 + line 18

PREPARED:

By________________

Date________________

APPROVED:

By________________

Date________________

SUBMITTED:

By________________

Date________________

TECHNICAL NOTES:

[a] Worksheet 3.11.1, department 1
Worksheet 3.11.2 to 3.11.n-1, departments 2 to n-1
Worksheet 3.11.n, all departments

WORKSHEET 3.12; INSTRUCTIONAL WORKLOADS

Distribution of Projected Instructional Workload Expressed as Clock Hours of Class Meetings per Week, at Specified Planning Stage, by Department, Type of Meeting Facility, and Class Size Range

Institution________________ Type of Meeting Facility[a]______________ Planning Stage____________

		Room Periods of Meeting per Week in Specified Class Size Ranges											
	Subject Field or Department 1	Under 20 2	20-29 3	30-39 4	40-49 5	50-59 6	60-79 7	80-99 8	100-149 9	150-199 10	200-249 11	250 and Over 12	All Classes 13
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

(Continued)

WORKSHEET 3.12 (Continued)

		Room Periods of Meeting per Week in Specified Class Size Ranges											
	Subject Field or Department 1	Under 20 2	20-29 3	30-39 4	40-49 5	50-59 6	60-79 7	80-99 8	100-149 9	150-199 10	200-249 11	250 and Over 12	All Classes 13
13													
14													
15													
16													
17													
18	Total												

DATA SOURCES:

Data for Columns 1-12 are from Worksheet series 3.9.
Data for Column 13 are derived by aggregating entries on columns 2-12.

PREPARED:
By
Date

APPROVED:
By
Date

SUBMITTED:
By
Date

TECHNICAL NOTES:

[a]Worksheet 3.12.1: Auditorium or lecture hall
3.12.2: Regular classroom
3.12.3: Seminar, recitation, discussion
3.12.4: All classroom-type facilities
3.12.5: Special purpose instructional space
3.12.6: Other space

CHAPTER 4

STAFF REQUIREMENTS

A. Staff Census

The projection of faculty and staff requirements at each planning stage is the basis for estimating a large proportion of building space at any college or university. Offices, research area and service facilities of various types are estimated in terms of work area required for faculty members and supporting staff. These projections also are useful in planning connected with long-range operating budgets and serve as a vehicle for improving academic program planning.

Key policy assumptions are involved in estimating faculty and staff needs and these require high level review within each institution. As a starting point for such review, a comprehensive analysis of the actual staffing patterns of the institution should be carried out. It is recommended that the fiscal year used for such analysis be the same as the base year reference for the over-all programming study.

The base year inventory of faculty and staff should cover all departments and divisions of the institution operating on the home campus, including non-institutional personnel such as employees of federal, state, and other agencies. The criteria for inclusion is the provision of office or work space on the campus.

Worksheet 4.1 indicates a format that may be used for such a census or inventory. The worksheet suggests a series of categories into which staff may be grouped. For purposes of analysis, it is useful to make both head count and FTE tabulations of faculty and staff. Appendix C provides a listing of personnel titles grouped in general categories to illustrate possible methods of classification. Since institutional practices and policies vary widely, it may be necessary to adapt the categories to the classification and record-keeping system of the institution. Thus, the forms and categories listed should be viewed as suggested, not required. The broad personnel categories are as follows: faculty and other professional; student; supporting technical; supporting clerical; other.

Analysis should be made by department and division so that these may subsequently be related to subject fields in instructional departments and to locational groupings. Departments and divisions should then be grouped by functional categories. These functional categories follow the state budget forms and were used in the building inventory established for the 1959-60 Baxter study. A suggested coding of these functional categories is given in Appendix D, table D.1. The broad functional categories are as follows: instruction; research; library and museum; public service; administration and general; plant operation and maintenance; organized activities related to instruction; auxiliary enterprises; housing and food service; non-institutional agencies; other.

B. Projection of Staff Requirements

The projection of staff needs should be based upon an analysis of the load factors relating to a given department and type of personnel. Worksheet 4.2 is designed for the delineation of the basis for projecting staff needs in each department. The definition of what constitutes an FTE staff member and how staff is to be estimated should be explained on this worksheet.

For example, in instructional departments faculty requirements will be tied directly to student loads. Non-faculty staff requirements in instructional departments will be made a function of faculty requirements. In other departments or divisions, workloads are not necessarily tied directly to student numbers. But, wherever possible, some relationship between personnel requirements and projectable workloads should be sought. For example, physical plant maintenance personnel may be tied to gross building area, grounds maintenance workers to campus acreage, food service employees to meals served, and so on. In many cases, however, such measures are not available, and in these instances the exercise of judgment in making rough projection assumptions is required.

1. Faculty Requirements

Worksheet 4.3 provides a format for the projection of faculty requirements. The projection involves the consideration of two variables: a) an assumption with regard to the average teaching load per faculty member per week; and b) the projection of weekly departmental instructional workloads developed through the analyses conducted in Chapter 3. Worksheet 4.3 provides alternate bases for making the estimates of faculty requirements; it then permits the planning analyst to select or reject any of the formal estimates implied by the relationships suggested therein and specify the set of estimates to be used for planning purposes.

The method of estimating faculty requirements goes directly to the heart of the academic policies and instructional methods of the institution in each subject field and level of instruction. The method avoids the pitfalls of over-generalization entailed by the use of the broad student-faculty ratio concept. The calculation of faculty needs can vary according to changes in the mix of student loads by subjects and levels of instruction as predicted in the statistical model. As a result, shifts in instructional workloads among lower division, upper division and graduate level work will be reflected in changes in the relative number of FTE faculty required.

Worksheet 4.4 permits the conversion of projected faculty requirements into indexes of growth which measure the increases in faculty by any planning stage relative to the number of faculty assigned to each department in the base year. The worksheet also makes it possible to compare the relative rates of growth in faculty requirements among the various instructional departments at an institution over the planning interval described in the worksheets.

2. Non-faculty Staff Requirements

Worksheet 4.5 is designed to permit the projection of staff requirements other than faculty for both instructional and non-instructional departments, by position category. Faculty projections already made in worksheet 4.4 would be entered on this worksheet. But staff requirements in all other position categories would be calculated for the first time. The projection of non-faculty staff requirements will involve two previously developed sets of information: a) the data in worksheet 4.1 dealing with the base year inventory of personnel; and b) the planning assumptions specified in worksheet 4.2

regarding the basis for projecting staff requirements by position category in each department.

It should be noted that worksheet 4.4 does not distinguish as to the composition of total full-time faculty. Two possibilities are open to the planning analyst, depending upon the institution's policy with regard to the use of graduate assistants or teaching associates. First, it may be assumed that the projections of faculty requirements include the full-time equivalent student assistants, in which case the entry for student assistants in worksheet 4.5 will require an appropriate downward adjustment of the entry for projected faculty. The other possibility, of course, is that the projection of faculty requirements in worksheet 4.4 does not cover student assistants. In this case, the completion of this component of worksheet 4.5 would thus be carried out according to the general instructions described above.

For other categories of staff, requirements are also based upon anticipations of workload. In instructional departments, non-teaching staff requirements are usually tied to faculty size and ultimately to instructional workloads. Supporting technical and clerical personnel thus would normally be made a function of the total size of the combined faculty and student group in the instructional department. However, adjustments would have to be made to reflect the need for the staff to service anticipated research and community service workloads associated with the department but not specified directly in the preceding analyses. For non-instructional departments, the planning analyst must similarly devise an appropriate basis for projecting staff needs.

C. Final Staff Estimates

Worksheets 4.6 and 4.7 permit summaries of the staff projections to be developed in varying degrees of detail. These summaries are useful as a basis for quick comparison of the results of the projection procedure among departments, and position categories and planning stages.

The exact method of estimating staff requirements must be left to each institution, but the final reporting is to be summarized on the worksheets indicated in Chapter 4. Common sense should dictate the methods used to develop quantitative estimates of staff requirements. As long as the estimating factors are generally defensible, good judgment is valid for the purposes at hand.

WORKSHEET 4.1; STAFF REQUIREMENTS

Distribution of Personnel by Department, Position Category and Time Status

Institution____________________ Department____________________

	Position Category	Number of Personnel, Base Year[a]			
		Head Count		Full-Time Equivalent	
		Authorized	Filled	Authorized	Filled
	1	2	3	4	5
1	Faculty and other professional:				
2	Executive				
3	Department head				
4	Professional staff: non-faculty				
5	Faculty				
6	Research				
7	Other				
8	Student:				
9	Graduate assistant				
10	Research assistant				
11	Teaching assistant				
12	Other				
3	Supporting technical				
4	Supporting clerical				
5	Other:				
6	Housekeeping, custodial				
7	Food service				
8	Laborers				

(Continued)

WORKSHEET 4.1 (Continued)

	Position Category	Number of Personnel, Base Year[a]			
		Head Count		Full-Time Equivalent	
		Authorized	Filled	Authorized	Filled
	1	2	3	4	5
19	Other				
20	Total				

DATA SOURCES:

Col. 1 Institutional records. See Appendix C for suggested classification system.
Col. 2 Institutional records.
Col. 3 Institutional records.
Col. 4 Institutional records.
Col. 5 Institutional records.

PREPARED:	APPROVED:	SUBMITTED:
By	By	By
Date	Date	Date

TECHNICAL NOTES:

[a] Specify base year.

WORKSHEET 4.2; STAFF REQUIREMENTS

Description of Policy Planning Assumptions for Use in Projection of Personnel Requirements at Specified Planning Stage

Institution______________ Department______________ Planning Stage________

	Position Category	Full-Time Equivalent Workload	Basis for Projecting Future Staff Requirements
	1	2	3
1	Faculty and other professional:		
2	Executive		
3	Department head		
4	Professional staff: non-faculty		
5	Faculty		
6	Research		
7	Other		
8	Student:		
9	Graduate assistant		
10	Research assistant		
11	Teaching assistant		
12	Other		
13	Supporting technical		
14	Supporting clerical		
15	Other:		
16	Housekeeping, custodial		
17	Food service		
18	Laborers		
19	Other		

(Continued)

WORKSHEET 4.2 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 4.1
Col. 2: Policy planning assumption
Col. 3: Policy planning assumption

PREPARED:	APPROVED:	SUBMITTED:
By________	By________	By________
Date________	Date________	Date________

WORKSHEET 4.3; STAFF REQUIREMENTS

Projection of Faculty Requirements at Specified Planning Stage, by Subject Field or Department and Course Level

Institution____________________ Subject Field or Department______________ Planning Stage________________

	Course Level			
Item	Lower Division	Upper Division	Graduate	All Levels
1	2	3	4	5
1 Average teaching load per faculty member per week:				
2 Clock hours				
3 Course registrants (head count)				
4 Student periods				
5 FTE enrollment				
6 Projected departmental instructional workload per week:				
7 Clock hours				
8 Course registrants (head count)				
9 Student periods				
10 FTE enrollment				
11 Alternate estimates of faculty requirements:				
12 A: Based upon clock hours				
13 B: Based upon course registrants				
14 C: Based upon student periods				
15 D: Based upon FTE student/FTE faculty ratio				
16 E: Use				

(Continued)

WORKSHEET 4.3 (Continued)

DATA SOURCES:

Line 2: Policy planning assumption
Line 3: Policy planning assumption
Line 4: Policy planning assumption
Line 5: Policy planning assumption
Line 7: Worksheet series 3.11, line 9
Line 8: Worksheet series 3.8
Line 9: Worksheet series 3.11, line 17
Line 10: Worksheet series 3.8
Line 12: Line 7 + line 2
Line 13: Line 8 + line 3
Line 14: Line 9 + line 4
Line 15: Line 10 + line 5
Line 16: Policy planning decision by planning analyst

PREPARED:	APPROVED:	SUBMITTED:
By____________________	By____________________	By____________________
Date__________________	Date__________________	Date__________________

TECHNICAL NOTES:

Although this worksheet provides for alternate estimating procedures, the analyst need only use one procedure if desired.

WORKSHEET 4.4; STAFF REQUIREMENTS

Summary of Projected Faculty Requirements at Specified Planning Stage, by Subject Field or Department

Institution____________________ Planning Stage____________________

	Subject Field or Department	FTE Faculty		Index of Growth: Base Year = 1.000
		Base Year	Projected Requirements	
		(number)		
	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17	Total			

(Continued)

WORKSHEET 4.4 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 4.1 and 4.3
Col. 2: Worksheet series 4.1
Col. 3: Worksheet series 4.3
Col. 4: Col. 3 ÷ col. 2

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 4.5; STAFF REQUIREMENTS

Projection of Non-Faculty Staff Requirements at Specified Planning Stage, by Subject Field or Department and Position Category

Institution________________ Subject Field or Department____________ Planning Stage__________

	Position Category	FTE Staff: Base Year[c] (number)	Alternate Estimating Bases[a]			FTE Staff: Projected Requirements (number)
			Index of Growth	Number per FTE Faculty	Other[b]	
	1	2	3	4	5	6
1	Faculty and other professional:					
2	Executive					
3	Department head					
4	Professional staff, non-faculty					
5	Faculty					
6	Research					
7	Other					
8	Student:					
9	Graduate assistant					
10	Research assistant					
11	Teaching assistant					
12	Other					
13	Supporting technical					
14	Supporting clerical					
15	Other:					
16	Housekeeping, custodial					
17	Food service					

(Continued)

WORKSHEET 4.5 (Continued)

			Alternate Estimating Bases[a]			
	Position Category	FTE Staff: Base Year[c] (number)	Index of Growth	Number per FTE Faculty	Other[b]	FTE Staff: Projected Requirements (number)
	1	2	3	4	5	6
18	Laborers					
19	Other					
20	Total					

DATA SOURCES:

Col. 1: Worksheet series 4.1
Col. 2: Worksheet series 4.1
Col. 3: Worksheet series 4.2
Col. 4: Worksheet series 4.2
Col. 5: Worksheet series 4.2
Col. 6: Calculated by analyst, using data in columns 2-5.

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Select one.

[b] Specify.

[c] The figures in this column may be taken directly from Worksheet series 4.1, or may reflect a modification of those figures to take account of adjustments required in base year staffing patterns in light of base year workloads.

WORKSHEET 4.6; STAFF REQUIREMENTS

Summary of Projected Staff Requirements at Specified
Planning Stage, by Department and Position Group

Institution____________________ Planning Stage____________________

		Number of Staff Required					
	Department	Faculty and Other Professional	Student	Supporting Technical	Supporting Clerical	Other	Total
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17	Total						

(Continued)

WORKSHEET 4.6 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 4.5
Col. 2: Worksheet series 4.5
Col. 3: Worksheet series 4.5
Col. 4: Worksheet series 4.5
Col. 5: Worksheet series 4.5
Col. 6: Worksheet series 4.5
Col. 7: Worksheet series 4.5

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

WORKSHEET 4.7; STAFF REQUIREMENTS

Summary of Projected Staff Requirements, by Department and Planning Stage

Institution____________________

	Department	Number of Staff Required					
		Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	Total						

(Continued)

WORKSHEET 4.7 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 4.6
Col. 2: Worksheet series 4.6
Col. 3: Worksheet series 4.6
Col. 4: Worksheet series 4.6
Col. 5: Worksheet series 4.6
Col. 6: Worksheet series 4.6
Col. 7: Worksheet series 4.6

PREPARED:	APPROVED:	SUBMITTED:
By______	By______	By______
Date______	Date______	Date______

PART III

PHYSICAL PLANT

SPACE REQUIREMENTS

PART III

PHYSICAL PLANT SPACE REQUIREMENTS

Institutional physical plant requirements depend upon the projected activity levels of the various operating departments of the college or university and the unit planning criteria adopted for use in physical plant programming. In developing programs of present or future space requirements, the analysis may be conducted along either functional or administrative lines. If the former course is elected, a series of space categories is established and the programming effort focuses on each of these functional components of physical plant in turn. Alternately, each administrative unit may be dealt with in turn, and the analysis of all physical plant requirements associated with the particular unit would be completed before going on to the next department.

For reasons of clarity in exposition, this Manual of space programming is developed along functional lines. Over-all physical plant is divided into twelve broad space categories: classroom space; special purpose instructional space; office space; research space; library space; museum and gallery space; athletic activities space; housing space; food service space; staff and student service space; miscellaneous other space; and physical plant maintenance and operations space. Upon completing the portion of the Manual dealing with any one of these twelve broad categories, the analyst will have obtained the over-all institutional requirements for the particular functional category of space considered. Upon completing the programming of all twelve categories, the analyst can then establish the total space requirements of the institution by aggregation.

In addition, the total space requirements of each department can be determined by reorganizing the data and aggregating the projected departmental needs for the various components of space represented by the twelve broad functional categories.

Chapters 2 through 16 are devoted to an exposition of the method for programming the area requirements associated with each of the twelve broad space categories identified above. Analytically, the Manual takes approximately the same form in dealing with each category. First, the broad category is further subdivided into primary and auxiliary components. Second, the activity or workload generating the primary space needs is identified. Third, the workload estimates are combined with intensity of use and unit area physical planning criteria to obtain projections of primary space requirements in the particular broad category considered. Fourth, the primary component is augmented by an estimate of the auxiliary or service space needed to complement the primary allocation and make it completely workable relative to the expected workloads. Finally, by aggregating the primary and service components, the over-all space needs associated with a particular functional category are obtained. Planning stage and departmental assignment are always indicated.

The degree of detail and elaboration involved in the calculation of space requirements varies among the broad functional categories. For some components of physical plant, such as special purpose instructional space, a lengthy and detailed analysis is required. For other components, such as museum and gallery space, the programming method is less complex. In general, variations in the degree of complexity of the procedural outline are a function of the number of considerations involved in dealing with a particular component of physical plant and the degree of diversity among the space elements included within the broad category.

The physical planning criteria are presented in tabular form immediately following the text discussion of each space category. They reflect an analysis of the amounts of space required to perform the types of functions that may be involved. In some instances, it is the needs of an individual for a work station that determine the physical planning criteria. In other instances, the needs are generated by the characteristics of a particular piece of equipment. In still other types of space, the physical planning criteria reflect consideration of the extent to which supporting space, which varies widely in characteristics and encompasses a variety of elements, is needed to make the primary space allocation associated with individuals or equipment functionally satisfactory. In all instances, the criteria reflect the experience of the Consultants and other planners and institutions throughout the country in planning the typical quantities of space associated with various types of activities. Departures from these criteria may be necessary in the case of particular institutions or operating departments. Such departures presumably can be justified by the characteristics of the activities to be accommodated in the space, and rigid adherence to the recommended physical planning criteria should be eschewed in these cases.

One further consideration should be kept in mind. Implicit in the programming procedure is an evaluation of how intensively the space or capacity is to be used. This concept is most familiar in the case of teaching facilities; e.g., room utilization and student station utilization. However, the same consideration underlies all other components of physical plant. Thus, it is implicit in the decision to program single occupancy or multiple occupancy office space for various categories of personnel. It is implicit in the calculation of the capacity requirements associated with the reader station component of the library. It is also implicit in an evaluation of the turnover factor in dining facilities. To some extent the Manual assumes the adoption of certain planning criteria that have already been established through earlier studies sponsored by the Association. A case in point is the room and student station utilization criteria for scheduled space as developed in the Baxter studies. In other instances, the intensity of use criteria will reflect policy planning assumptions made by the planning analyst or institution involved. It should always be borne in mind that variations in the underlying assumption regarding the intensity of use of a particular space component are of significance and deserve at least as much attention as the actual physical planning criteria that may be used in developing the projections of space requirements.

CHAPTER 5

CLASSROOM SPACE

Instructional workloads in classroom-type facilities were projected for each planning stage by the methods outlined in Chapter 3. The general category "classrooms" is subdivided into three types: regular classrooms, seminar rooms, and lecture-auditoriums. This is because these types have different unit area requirements and different scheduling capabilities. This chapter outlines the method recommended for transforming classroom instructional workloads into room and station capacity and square footage requirements for each planning stage, along with the recommended utilization and unit area criteria.

A. Capacity Utilization Planning Criteria

Classroom utilization studies were carried out by the state supported institutions in Colorado in 1957, 1959, and 1961. These studies have been useful in two respects: a) they measure the efficiency with which available space is actually used; and b) they provide data from which subsequent planning can be carried out. Unfortunately, this latter aspect has been largely neglected in the past. The crux of the classroom utilization study is its value in planning to improve the use of facilities by achieving closer fit between classroom time demand and number of rooms and closer fit between the distribution of class sizes and the distribution of classroom sizes.

Classrooms are merely the physical tools of instruction. The primary objective must be to provide the proper tools to maximize the efficiency of the learning process; the frequency with which the tools are used is secondary to that first purpose. In planning future classroom need, therefore, the goal is to provide the right number of classrooms and the right size distribution to serve the educational program. Serious damage can be inflicted upon the educational program by a shortage of classrooms of the right size and kind. Furthermore, during the next decade, the problem in public colleges and universities will be to have enough classrooms at the right times to provide for the expected doubling and tripling of enrollments; it will not be difficult to improve rates of utilization under these conditions of rapid growth. Finally, it should be noted that while 90 percent of the organized formal instruction takes place in classrooms and teaching laboratories, these facilities compose as little as 10 percent and seldom more than 25 percent of the total floor area of an institution of higher education. Office space, research space, storage, shops, heating plants, warehousing, food service, residential space, libraries, gymnasiums, and many other types of facilities are required to support the instructional programs carried on in college teaching facilities.

Three criteria for intensity of use are relevant when considering the utilization of classroom-type space. The first is the room utilization rate; this may be defined as the number of hours during the teaching week that rooms are in scheduled use or, alternately, the proportion of the teaching week that rooms are in scheduled use. The second is the student station utilization rate, which may be defined as the proportion of available student station capacity that is occupied during the time that classroom-type facilities are in scheduled use. The third is the capacity utilization coefficient; this measures the average number of periods per week that student stations are in scheduled use, or, alternately, the proportion of total possible student station periods per week that stations are occupied.

To estimate future classroom requirements, levels for these utilization rates must be established as goals for achievement: that is, classroom capacity is determined for a given future instructional load by establishing an average rate of hours of scheduled use per room and a rate of station occupancy as a "standard." The number and size distribution of classrooms are calculated accordingly. The standards of utilization used must be determined from an extremely complex analysis of curriculum structure and class size distributions. The levels of the utilization standards must be such that scheduling conflicts are minimized and the distribution of classroom sizes is fitted to the distribution of class sizes with sufficient tolerance to allow for flexibility in class size and flexibility of time scheduling. If utilization rates are too high teaching efficiency may be impaired; moreover, the risk increases that individual students will not be able to fulfill their degree requirements at the proper time because of course schedule conflicts generated by an inadequate number of rooms. To insure that the distribution of classroom sizes does not artificially depress class sizes, classroom capacity must exceed demand most of the time; i.e., the number of stations available must exceed the number of students requiring accommodation.

In 1959-60, A. W. Baxter, Jr. recommended classroom utilization standards or goals for all of the existing state colleges and universities.[a] These were determined after careful study of the existing plants and programs of the institutions against a background of experience in other institutions around the country. The Association has concluded that these classroom utilization standards should be used for the time being for estimating future classroom requirements; within two or three years the standards may be restudied in light of experience. The Baxter criteria are summarized in table 5.1.

In practice, the computation of classroom space requirements is not so simple because it is essential that the distribution of classroom sizes be determined to adequately accommodate the expected distribution of class meeting enrollment sizes. The method recommended in this chapter is designed to take the distribution of class sizes into account.

The utilization criteria recommended by Baxter apply to general classrooms. Seminar rooms and larger lecture auditoriums have different scheduling and utilization capabilities; therefore, station utilization and room utilization rates for these types of facilities should be adjusted accordingly. Each institution should analyze the utilization capabilities of facilities of this type and adjust the utilization criteria accordingly. Table 5.1 also suggests the criteria recommended for seminar rooms and lecture auditoriums.

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[a] A. W. Baxter, Jr., *Capital Outlay for Higher Education...for the Public Junior and Senior Colleges and the Universities in Colorado*, Report to the Colorado Legislative Committee on Education Beyond High School, June 1960, p. 35.

The recommended variations allow for the fact that seminar rooms (also used for departmental conferences, honors groups, graduate examinations, etc.) have a lower capacity in scheduled hours per week because of their use for nonscheduled purposes and because graduate seminar-type classes often are restricted to late afternoon because of the teaching duties of a large proportion of graduate students. Lecture auditoriums, because of their size -- determined by maximum class sizes requiring their special facilities and by the fact that they often serve nonscheduled activities as well -- cannot always be scheduled to full capacity; they should be capable of more scheduled hours per week but their station occupancy averages usually are lower.

The utilization "standards" being discussed must be viewed as goals. The rates at which institutions are capable of achieving higher utilization are limited by the nature of existing facilities. This is especially true of station occupancy rates. If the distribution of classroom sizes is considerably larger than the distribution of class sizes, it is impossible to raise the average percentage of stations occupied when rooms are in use without raising class size averages -- a matter of educational policy. If an institution has too many rooms of the wrong sizes, it will have difficulty achieving higher utilization. The object must be to correct these imbalances, but this can be done only over a period of time while new classrooms are constructed, old ones remodeled or converted to other uses. Given better methods of estimating numbers and sizes of classrooms needed by the instructional program and distribution of class size, the physical obstructions to improved utilization can be corrected fairly quickly (several years)in a period of rapid growth, less quickly when growth is slow. It is therefore recommended that the Baxter utilization standards be established as the standards in the last three planning stages, and that transitional levels be used between current utilization rates and the utilization goals. In other words, lower standards may be used in the earlier planning stages; but by the last stage, the classroom supply should be expected to match demand at the levels of utilization recommended by Baxter.

Worksheet 5.1 is provided for each institution to report the levels of utilization to be used as planning factors at each planning stage. The transitional stages should be such that the amount of classroom space constructed will not exceed the amount required in the last three planning stages. If existing classroom station capacity, given the Baxter utilization standards, is theoretically sufficient to handle the enrollments projected at the later planning stages, this does not mean that no new classrooms should be built, for it is essential that older and more inefficient rooms be replaced by better facilities adapted to the instructional programs and class size distribution of the institution.

It will be noted that worksheet 5.1 calls for several other measures of utilization. The normal scheduling week is the number of hours per week during daytime hours (7:00 AM to 6:00 PM) during which classes are normally scheduled. A norm of 44 hours per week is recommended as the measure to be used for all institutions for purposes of comparison. This is based on a normal schedule week of Monday through Friday between 8:00 AM and 12:00 noon, 1:00 PM and 5:00 PM, and Saturday from 8:00 AM to 12:00 noon; alternately, it may mean scheduling from 7:00 or 8:00 AM to 5:00 or 6:00 PM, excluding the noon hour, or from 8:00 AM to 5:00 PM, including the noon hour, depending upon the manner in which the institution prefers to schedule. By itself, the 44-hour week means little except to serve as a measure of absolute maximum schedule time. Compared with the average room utilization standard of 29 or so hours per week per room, this gives an indication of the degree to which the problem of avoiding scheduling conflicts limits the hours per week in which rooms may be scheduled as an optimum. The "capacity utilization coefficient" is a general measure of the limits of utilization implied by the standards used.

As planning techniques become more effective, as improved data resources are developed, and as the planning of educational programs and practices become more closely articulated with physical planning, it should be possible to gradually raise the standards of classroom utilization. In the next decade, however, with unprecendented enrollment growth and the constant threat that the availability of building facilities will lag behind the need, the utilization levels established by the Baxter study are reasonable and economical goals for achievement.

The classroom utilization standards have a further use which may be noted here: when periodic studies of actual utilization reveal that an institution is approaching or exceeding the levels of utilization recommended, this is a cue that additional classroom capacity is needed to avert the danger of increasing schedule conflicts and artificially depressing desirable growth in the sizes of classes. While this is only one of many factors that must be taken into account in setting building priorities within and among the institutions, it does justify at least biennial studies of actual utilization as an aid to determining the need for additional classroom capacity. This statement must be accompanied by the warning that a relatively small part of the capital construction requirements of the colleges and universities involves classrooms and that utilization rates alone cannot be used to set priorities.

B. Physical Planning Criteria

Area per classroom station, expressed in assignable square feet (a.s.f.) per station, varies with the size and type of room and type of station. Generally, the smaller the room, the larger the area per station because of the fixed requirements of area for aisles and for the instructor's station at the front of the room. In addition to the immediate area of the room, allowance must be made for auxiliary service space such as preparation rooms, projection booths, storage of teaching materials and the like.

The recommended physical planning criteria for this study are shown in table 5.2. The specific recommendations cover both the unit area allocation per station and the percentage allowances for auxiliary service space. The criteria represent typical figures adaptable to architectural designs in which room widths might vary from 16 feet to 50 feet. Naturally, some variation in the criteria might be required as the room width approaches the extremes of the 16-50 foot range.

Since the projected room size distribution will vary from the specific numbers of stations listed in table 5.2 in some instances, and since different types of stations may be desirable in certain instances, the recommended standards are further broken down on table 5.3.[a] To permit the calculation of area for varying numbers of stations, the program area is broken down into the area immediately occupied by the station furniture and the area per room allowed for internal circulation and the instructor station. The circulation area allowance is actually the mid-point of the room size ranges used in the table, thus constituting an approximate average for the range. (The 8 square feet per station is based on spacing tablet armchairs 3' 0" from back to back and 2' 8" from centers laterally; in "case study" Type 3 rooms using rows of 24" wide tables and ordinary chairs, an additional 4 square feet per station is required.)

The Type 3 "case study" classroom in which rows of tables and chairs are used requires more area per station, but this type facility is increasingly in demand for certain types of instruction, especially in business and engineering where classwork involves more extensive use of books and paper materials. It may be noted that in a room ranging from 550 to 680 assignable square feet, between 26 and 35 stations of Type 3 may be installed compared with 46 to 55 tablet armchairs in Type 1. Experience with Type 3 installations indicates that they are more effective as teaching facilities in certain fields with classes of less than 50, justifying the greater station area requirement.

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[a] Developed by Dr. Thomas R. Mason, Director of Institutional Research and Planning, University of Colorado.

The percentage increment for auxiliary classroom service space will be applied to the aggregate classroom program space projected for the institution; it constitutes an allowance for such facilities although the exact arrangement of auxiliary space cannot be determined until actual projects are in the architectural planning stage.

C. Outline of Procedure

Worksheet 5.1 provides for the specification of the room and student station utilization criteria to be used in estimating capacity requirements in classroom-type facilities at each planning stage. The worksheet permits identification of the criteria to be used for lecture-auditoriums, regular classrooms and seminar rooms. The criteria are to be expressed in five ways: room utilization in terms of absolute number of hours; room utilization as a percentage of the normal teaching week; student station utilization as a percentage of the available capacity when rooms are in use; capacity utilization expressed in terms of total student periods per station per week; capacity utilization as a percentage of total potential student station periods available during the over-all teaching week. In completing this worksheet, the final stages should reflect the utilization criteria recommended in the Baxter studies and adopted by the Association. Variations from the Baxter criteria should be explained.

Worksheet 5.2 calls for the analysis of room and student station capacity requirements in classroom-type facilities. First, the workload projections already completed in Chapter 3 are drawn upon for the distribution of class periods per week by class size. For each class size, the appropriate room utilization criterion is used as a divisor to determine, as a first approximation, the total number of meeting rooms required. This first approximation is then adjusted to eliminate fractional room estimates and to assure consistency with the control total for number of meeting rooms required calculated at the same time. The room size distribution is then obtained by increasing the median class size of each size range by a factor equal to one divided by the recommended student station utilization coefficient. For each room size, total projected student station capacity is then estimated by multiplying the number of meeting rooms required by the number of stations per room. Total student station capacity is obtained by aggregation.

Once the number and size distribution of meeting rooms required in classroom-type space is established,worksheet 5.3 should be used for determining space requirements. Both primary and service space components of classroom-type facilities may be computed on this worksheet. Given the room size distribution indicated in worksheet 5.2, the physical planning criteria recommended in tables 5.2 and 5.3 may be used to determine the room area allocation in each room size class. When multiplied by the number of meeting rooms required, the primary space requirements associated with a particular room size group are obtained. Application of the planning ratio for service space to primary space recommended in table 5.2 will then permit development of the service space allocation associated with each room size range. Simple addition of the primary and service space components will yield total space requirements by room size range and further aggregation will yield the estimated total requirement for all classroom space.

Worksheet 5.4 is devoted to summarizing the requirements for classroom-type space at each planning stage. All space requirement data can be drawn from worksheet 5.3. Sub-classifications are provided for by type of room (lecture-auditorium, regular classroom, seminar room) and space category (primary space, service space). Simple aggregation yields the figures for total space required in classroom-type facilities at each planning stage.

TABLE 5.1; CLASSROOM SPACE

General Utilization Standards Recommended for Classroom-Type Facilities

Type of Facility	Room Utilization Average Hours per Week of Scheduled Use per Room	Student Station Utilization Average Proportion of Stations Occupied When Rooms are in Scheduled Use	Capacity Utilization Average Weekly Student Periods per Classroom Station
REGULAR CLASSROOMS			
University of Colorado	29	67%	19.4
Colorado State University	28	70%	19.6
Colorado State College	29	70%	20.3
Adams State College	27	64%	17.3
Western State College	29	70%	20.3
Colorado School of Mines	25	62%	15.5
Fort Lewis College[a]	29	61%	17.7
Southern Colorado State College[a]	29	70%	20.3
SEMINAR-CONFERENCE ROOMS	24	75%	18.0
LECTURE-AUDITORIUM	29	60%	17.4

---

[a] Fort Lewis standards will be affected by change to trimester program; the standards for SCSC are the same as those for CSC and WSC, rather than those recommended for Pueblo Junior College by Baxter.

25
15
12.5
25
77.5

17
17

26
20

TABLE 5.2; CLASSROOM SPACE

Recommended Planning Criteria for the Allocation of Space to Classroom-Type Facilities

(these are tight)

		Primary Space[a]		Service Space[b]	
	Space Category and Room Capacity	Unit Area Allocation per Station (square feet)	Program Area (square feet)	As Percent of Primary Space (percent)	As Percent of Total Space (percent)
	1	2	3	4	5
1	Regular classrooms				
2	Capacity: 20 stations	17.6[c]	352	7.0	6.5
3	" : 30 stations	14.4[c]	432		
4	" : 40 stations	13.0[c]	520		
5	" : 50 stations	12.1[c]	605		
6	" : 60 stations	11.5[c]	690		
7	" : 75 stations	10.9[c]	818		
8	" : 100 stations	12.7[d]	1270		
9	" : 125 stations	11.9[d]	1488		
10	" : 150 stations	11.3[d]	1695		
11	" : 175 stations	10.9[d]	1908		
12	" : 200 stations	10.6[d]	2120		
13	Seminar-conference rooms				
14	Capacity: 10 stations	20.0	200	7.0	6.5
15	" : 20 stations	20.0	400		
16	" : 30 stations	18.0	540		
17	Lecture auditoriums				
18	Capacity: 500 stations	9.2	4600	20.0	17.0
19	" : 1000 stations	8.6	8600		
20	" : 1500 stations	8.2	12300		

35
14
140
35

12
[illegible]
42

---

[a] These are general classroom facilities. The unit allocation criteria permit inclusion of projection facilities, demonstration benches for science lectures, other special equipment in addition to the actual seating stations.

[b] This is a net addition to the primary space. It may be treated as a function of the aggregate allocation to either primary space or total space. Included are preparation rooms, projection booths, stages, dressing rooms, storage facilities.

[c] Includes two longitudinal aisles, no rear aisle.

[d] Includes three longitudinal aisles and one rear aisle.

From Colorado Space Manual.

TABLE 5.3; CLASSROOM SPACE

Alternate Basis for Calculating Allocation to Primary Component of Classroom-Type Facilities; Classroom Station Area Standards, by Number of Stations in Room and Type of Room

		Primary Space[a]		
	Type of Room and Number of Stations 1	Component A Unit Area Allocation per Station 2	Component B Allocation to Circulation in Room 3	Total Area Required for Room 4
1	Type 1: Tablet-Armchairs, 2 longitudinal aisles, no rear aisle			
2	16 - 25	8	190	320 - 390
3	26 - 35	8	195	390 - 475
4	36 - 45	8	200	475 - 560
5	46 - 55	8	205	560 - 645
6	56 - 70	8	210	645 - 770
7	71 - 90	8	220	770 - 940
8	Type 2: Tablet-Armchairs, 3 longitudinal aisles, 1 rear aisle			
9	91 - 125	8	470	1200 - 1470
10	126 - 175	8	495	1470 - 1895
11	176 - 225	8	520	1895 - 2320
12	Type 3: Rows of Tables and Chairs, 2 longitudinal aisles			
13	16 - 25	12	250	440 - 550
14	26 - 35	12	260	550 - 680
15	36 - 45	12	270	680 - 810
16	46 - 55	12	280	810 - 940
17	Type 4: Lecture Auditoriums			
18	176 - 225	8	520	1895 - 2320
19	226 - 375	8	530	2320 - 3530
20	376 - 500	8	600	3530 - 4600
21	501 - 1000	8	600	4600 - 8600
22	1001 - 1500	7.8	600	8600 - 12300

(Continued)

$$\frac{\text{Floor Area} - \text{Circulation Factor}}{\text{Unit area per station}} = \text{Computed Stations}$$

TABLE 5.3 (Continued)

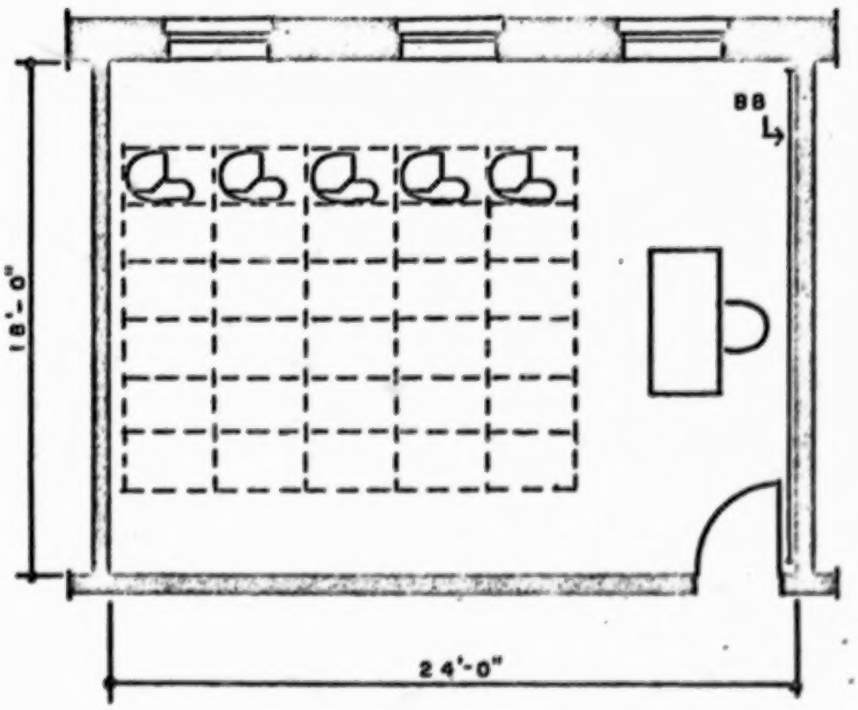
	Type of Room and Number of Stations	Primary Space[a] Component A Unit Area Allocation per Stations	 Component B Allocation to Circulation in Room	 Total Area Required for Room
	1	2	3	4
23	Type 5: Seminar-Conference Rooms			
24	-- - 10	20	(included in station area)	-- - 200
25	11 - 20	20		200 - 400
26	21 - 30	18		400 - 540

[a] In square feet

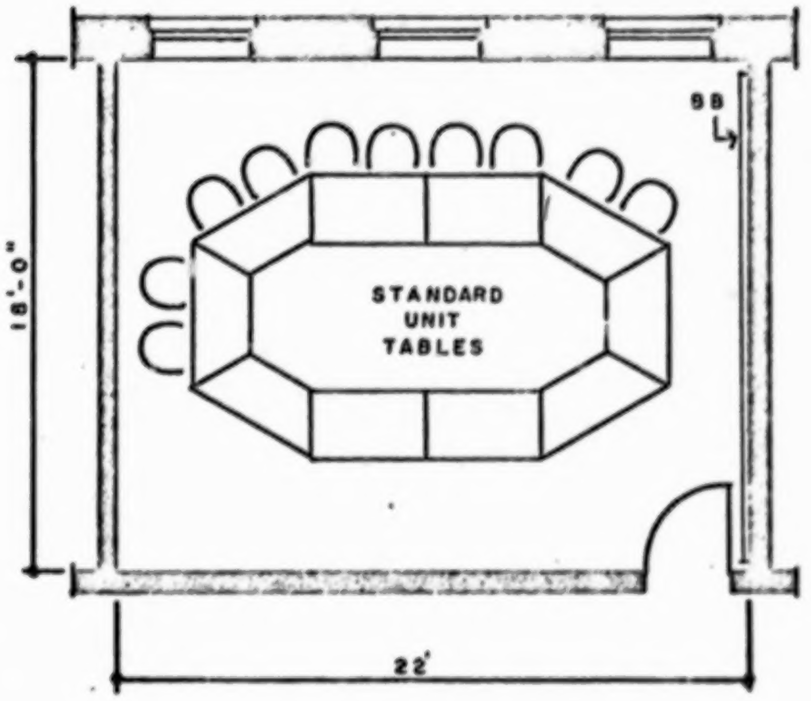
Source: Dr. Thomas Mason, Director of Institutional Research and Planning, University of Colorado

80
8
640
220
860

PLATE 5-1, CLASSROOM SPACE
TYPICAL PHYSICAL PLANNING CRITERIA



REGULAR CLASSROOM 14.2 SQ FT / STATION


BB
STANDARD
UNIT
TABLES
18'-0"
22'

SEMINAR ROOM 20 SQ FT / STATION

0 1 2 3 4 5
10
20 FT.

WORKSHEET 5.1; CLASSROOM SPACE

Room and Student Station Utilization Criteria to Be Used in Estimating Capacity Requirements in Classroom-Type Facilities

Institution____________________ Department____________________

	Item	Actual Fall 196_	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Normal length of teaching week (hours)							
2	Lecture-auditoriums:							
3	Room utilization criteria:							
4	Room periods per week: number							
5	Room periods per week: percent							
6	Student station utilization rate: percent							
7	Capacity utilization coefficient:							
8	Student periods per station per week: number							
9	Student periods per station per week: percent							

(Continued)

WORKSHEET 5.1 (Continued)

	Item	Actual Fall 196_	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
10	Regular classrooms:							
11	Room utilization criteria:							
12	Room periods per week: number							
13	Room periods per week: percent							
14	Student station utilization rate: percent							
15	Capacity utilization coefficient:							
16	Student periods per station per week: number							
17	Student periods per station per week: percent							
18	Seminar rooms:							
19	Room utilization criteria:							
20	Room periods per week: number							
21	Room periods per week: percent							
22	Student station utilization rate: percent							

(Continued)

WORKSHEET 5.1 (Continued)

	Item	Actual Fall 196_	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
23	Capacity utilization coefficient:							
24	Student periods per station per week: number							
25	Student periods per station per week: percent							

DATA SOURCES:

Line 1: Policy planning assumption
Line 2: No entry
Line 3: No entry
Line 4: Baxter Report
Line 5: Line 4 ÷ line 1
Line 6: Baxter Report
Line 7: No entry
Line 8: Line 6 x line 4
Line 9: Line 6 x line 5
Line 10: No entry
Line 11: No entry
Line 12: Baxter Report
Line 13: Line 11 ÷ line 1
Line 14: Baxter Report
Line 15: No entry
Line 16: Line 14 x line 12
Line 17: Line 14 x line 13
Line 18: No entry
Line 19: No entry
Line 20: Baxter Report
Line 21: Line 18 ÷ line 1
Line 22: Baxter Report
Line 23: No entry
Line 24: Line 22 x line 20
Line 25: Line 22 x line 21

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

WORKSHEET 5.2; CLASSROOM SPACE

Projection of Room and Student Station Capacity Requirements in Classroom-Type Facilities, by Capacity Size Range

Institution________________ Department__________ Planning Stage______________

	Class Size Range (number of stations) 1	Class Periods per Week 2	Room Utilization Criterion: Room Periods per Week 3	Meeting Rooms Required: Calculated 4	Meeting Rooms Required: Adjusted 5	Room Size: Median Class Size 6	Room Size: Room Size: Number of Stations 7	Projected Student Station Capacity 8
1	Under 20					10		
2	20 - 29					25		
3	30 - 39					35		
4	40 - 49					45		
5	50 - 59					55		
6	60 - 79					70		
7	80 - 99					90		
8	100 - 149					125		
9	150 - 199					175		
10	200 - 249					225		
11	250 and over					300		
12	Total							

DATA SOURCES:

Col. 1: Policy planning assumption
Col. 2: Worksheet series 3.12
Col. 3: Worksheet 5.1
Col. 4: Col. 2 ÷ Col 3
Col. 5: Col. 4 rounded by planning analyst
Col. 6: Analysis of Col. 1
Col. 7: Either 1) planning analyst, or 2) Col. 6 ÷ student station utilization rate listed in Worksheet 5.1
Col. 8: Col. 7 x Col. 5

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

WORKSHEET 5.3; CLASSROOM SPACE

Projection of Space Required in Classroom-Type Facilities, by Room Size Range and Primary-Service Space Classification

Institution ______________ Department ______________ Planning Stage ______________

		Unit Area Allocation Criteria			Program Area			
	Room Size (number of stations) 1	Per Station (square 2	Per Room feet) 3	Meeting Rooms Required 4	Primary Space Requirements (square feet) 5	Planning Ratio: Service Space/ Primary Space 6	Service Space Requirements (square feet) 7	Total Space Requirements (square feet) 8
1								
2								
3								
4								
5								
6								
7								
8								
9								

(Continued)

WORKSHEET 5.3 (Continued)

					Program Area			
	Room Size (number of stations)	Unit Area Allocation Criteria		Meeting Rooms Required	Primary Space Requirements (square feet)	Planning Ratio: Service Space/ Primary Space	Service Space Requirements (square feet)	Total Space Requirements (square feet)
		Per Station (square	Per Room feet)					
	1	2	3	4	5	6	7	8
10								
11								
12	Total							

DATA SOURCES:

Col. 1: Worksheet series 5.2, Col. 7
Col. 2: Table 5.2
Col. 3: Table 5.2 or 5.3, or Col. 1 x Col. 2
Col. 4: Worksheet series 5.2, Col. 5
Col. 5: Col. 4 x Col. 3
Col. 6: Table 5.2
Col. 7: Col. 5 x Col. 6
Col. 8: Col. 5 + Col. 7

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

Decision as to room type should be specified here in worksheet. I.e., seminar room vs. regular classroom, regular classroom vs. lecture auditorium. If desired, procedure can be standardized so that all rooms of 20 stations or less are treated as seminar rooms, rooms of 21-125 stations are treated as regular classrooms, and all larger rooms are treated as lecture-auditoriums.

WORKSHEET 5.4; CLASSROOM SPACE

Summary of Space Required in Classroom-Type Facilities, at Selected Planning Stages

Institution____________________ Department____________________

	Type of Room and Space Category	Planning Stage					
		I	II	III (square feet)	IV	V	VI
	1	2	3	4	5	6	7
1	Lecture-auditoriums:						
2	Primary space						
3	Service space						
4	Subtotal						
5	Regular classrooms:						
6	Primary space						
7	Service space						
8	Subtotal						
9	Seminar rooms:						
10	Primary space						
11	Service space						
12	Subtotal						
13	All classroom-type rooms:						
14	Primary space						
15	Service space						
16	Total						

(Continued)

WORKSHEET 5.4 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet series 5.3, Col. 5
Line 3: Worksheet series 5.3, Col. 7
Line 4: Worksheet series 5.3, Col. 8
Line 5: No entry
Line 6: Worksheet series 5.3, Col. 5
Line 7: Worksheet series 5.3, Col. 7
Line 8: Worksheet series 5.3, Col. 8
Line 9: No entry
Line 10: Worksheet series 5.3, Col. 5
Line 11: Worksheet series 5.3, Col. 7
Line 12: Worksheet series 5.3, Col. 8
Line 13: No entry
Line 14: Sum of lines 2, 6 and 10
Line 15: Sum of lines 3, 7 and 11
Line 16: Sum of lines 4, 8 and 12

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

CHAPTER 6

SPECIAL PURPOSE INSTRUCTIONAL SPACE

The heading "Special Purpose Instructional Facility" comprehends those specialized scheduled instructional rooms in which students perform work with equipment and materials, including wet and dry science laboratories, drafting rooms, music and art studios, language laboratories, practice rooms and shops. The key characteristic is the special purpose nature and general absence of interchangeability of these rooms.

Instructional workloads for these facilities were projected in Chapter 3. The procedure recommended in this chapter for projecting the capacity and area requirements allows for considerable variation in approach. Projections should be made on a course-by-course or lab-by-lab basis. This approach yields data which may be used directly in programming new facilities or remodeling.

A. Capacity Utilization Planning Criteria

Because of their particular and special nature, utilization of special purpose teaching facilities cannot be approached arbitrarily. If a given course requiring laboratory-type instruction is to be offered, the facilities must be provided regardless of utilization. Highly specialized advanced courses with limited enrollments will usually have low utilization in hours per week until the size of the institution is such that multiple laboratory sections are feasible. In order to determine the number of rooms and the number of stations required, however, levels of optimum room and station use must be established for planning purposes. The most widely used average utilization criteria for special purpose teaching facilities are 24 periods per week with 80 percent of stations occupied when rooms are in scheduled use. These are averages, not necessarily valid for particular laboratories. Because laboratory sessions usually are more than one period in sequence, they tend to obstruct larger blocks of schedule time. Overscheduling leads to schedule conflicts. Thus, the utilization rates expected for special purpose teaching facilities are lower than for classrooms.

For planning purposes, optimum room and station utilization criteria must be established to determine the number of rooms and number of stations required. If the course is offered at all, a minimum of one laboratory room must be provided, regardless of course enrollment. The number of laboratory stations should be geared to the number of students desirable in a single laboratory section.

The function of utilization criteria in planning capacity in special purpose facilities may be understood from the following. First, consider room requirements. As course registrations grow, the number of sections of the desired size increases. As the number of laboratory periods per week increases with the number of sections, the hour utilization per week of a single laboratory room will approach a point at which scheduling conflicts increase. At this point, another laboratory room will be needed, so that more than one laboratory section can be held concurrently. Thus, for planning purposes, hour utilization standards should be viewed as scheduling saturation points, signalling the need for another laboratory room. Second, consider station requirements. For laboratories, these usually are determined by the desired section size plus an increment to allow flexibility. Typically, the desired section size multiplied by 1.25 (the equivalent of 80 percent station occupancy) is used to program room capacity. Thus, a laboratory for sections of 20 students should be designed for 25 stations. This allows a 25 percent increase in the section size before another section has to be set up with accompanying cost of additional instructor time. Any greater increase in section size would impair the quality of instruction; any smaller increment would force the establishment of an additional section of small enrollment before it is needed. For example, say that an advanced science course starts with 15 students; optimum section size is 20 students; 25 laboratory stations are provided. When course registrations reach 26 students, another section must be established. The two sections would average 13 students. But if only 20 stations were provided in the room and a new section were required when 21 students registered for the course, two sections averaging 10.5 students would be required. The extra station capacity is vital to allow for operational economy of this type.

The average utilization criteria for special purpose instructional facilities are derived from the 1960 Baxter Study. These are tabulated for each institution in table 6.1. Baxter did not make any recommendations for station occupancy rates, but 80 percent is recommended for calculating the average student hours per week per station. The variation among institutions is the result of Baxter's analysis of existing teaching laboratories at each institution. It must be emphasized that these are institution-wide average standards. When dealing with particular laboratories, the average may be exceeded in cases of multiple-section courses but almost always will fall short in more specialized courses with smaller registration levels.

Baxter set the normal schedule week at 30 hours for teaching laboratories (compared with 44 hours for classrooms) because laboratory time blocks are more difficult to schedule and because most laboratories require "down" time for clean-up, stocking, and set-up of materials. Baxter called the midpoint between the recommended average hour utilization standard and the 30-hour schedule week the "Average Schedule Density Threshold." He used this to gauge the extent to which institutions were suffering from overscheduling of teaching laboratories in certain areas; this measure was intended to serve as a danger signal.

When teaching laboratory needs are projected on a course-by-course basis, another approach is required. Different laboratories will have different optimum scheduling capacities according to the structure of the courses involved. These capacities will vary according to two factors: a) the mix of class sizes in lecture, recitation and laboratory groups; and b) the mix of meeting periods per week required in lecture, recitation and laboratory meetings. An effort should be made to determine the optimum number of laboratory sections which can be scheduled for the course without having scheduling conflicts between laboratory and lecture-recitation sections of the same course or pair of complementary courses. The longer the laboratory period required and the more lecture-recitation hours scheduled in association, the smaller the maximum number of hours per week of possible scheduled utilization in a given laboratory room.

When these upper limits are approached in programming laboratory requirements, they are cues for the addition of more laboratory units. Whether these will average out at 24 hours per week for all laboratories will depend upon the structure and mix of laboratory courses at a given institution.

B. Physical Planning Criteria

Table 6.2 lists the recommended unit area allocation criteria for special purpose instructional facilities in all fields and levels of instruction. Table 6.3 enumerates the recommended planning criteria for programming the service or auxiliary space needed to supplement the primary space component.

The criteria indicate allocations per student station and the proportion that service area is of total space classified under the general teaching laboratory heading. It is impossible to define these criteria for all types of situations. Generally speaking, the unit planning criteria for lower division facilities assume capacities of 24 to 40 stations. Outside this capacity range, the unit standards should be modified; i.e., higher standards for rooms with fewer than 20 stations, smaller allocations for rooms with more than 40 stations. For the upper and graduate division criteria, the assumed ranges are 12 to 24 stations and 4 to 12 stations, respectively. When fewer than four students are involved in laboratory work, it is assumed that the room designation will probably fall in the research space category and the appropriate space allocation criteria will be those that apply to research space. The unit area allocation criteria encompass all storage and service space normally included within the laboratory itself. Wherever appropriate or necessary, different criteria are indicated when the subject matter necessitates such differentiation. The table suggests the subject areas that can be dealt with under the proposed standards. Naturally, the references to course matter coverage are in no sense comprehensive.

The service space coefficient refers to the typical situation in large and small departments. The demarcation point is generally at about 10,000 square feet of total special purpose teaching space, or 7,000-7,500 square feet of primary teaching space. Wherever the large-small distinction was not possible, a single coefficient is indicated.

Naturally, the needs of individual departments might dictate variations from these proposed criteria. It's possible to satisfy the station requirements and service space needs with both higher and lower criteria. However, as in the case of the classroom space allocations, the enumerated criteria are designed to permit comfortable working conditions.

C. Outline of Procedure

Worksheet 6.1 should be used for recording the room and student station utilization criteria to be used in projecting capacity requirements in special purpose instructional facilities at each planning stage. The worksheet calls for a specification of the following information: a) the length of the teaching week in special purpose instructional facilities; b) the room utilization criteria to be used in calculating the number of rooms required in special purpose facilities, expressed in terms of number of room periods per week and proportion of teaching week which rooms are expected to be used; c) the adopted student station utilization criteria, expressed as the proportion of available capacity in special purpose facilities to be occupied when such facilities are in use; and d) the overall capacity utilization criteria, expressed as the total number of student periods per station per week that should be expected as well as the proportion of aggregate student station capacity used during the teaching week. The criteria should be consistent with the Baxter recommendations and any expressions of Association policy regarding room and student station utilization goals for special purpose instructional facilities.

Worksheet 6.2 focuses upon the projection of student station capacity in various types of special purpose instructional facilities. A separate worksheet should be developed for each course level group, planning stage and subject field. The first step is the determination of the number of different facilities required to satisfy the instructional workloads at each level. The analyst must use his judgement in this regard for this involves the question of the extent to which facilities may be used interchangeably to accommodate the needs of several different types of courses that may be offered. Consultation with representatives of the individual departments may be necessary for the analyst to implement this aspect of the programming procedure. Upon specification of the number of different facilities required and the courses that can be taught in each special purpose facility, the analyst can draw upon the information developed in Chapter 3 regarding the projected student registrations associated with the specified courses in order to obtain the total registration load in each facility. The data on preferred class sizes developed in Chapter 3 should then be introduced. These figures should be adjusted by the planning analyst to the programmed room size basis, usually by raising the preferred class size figures by a factor which on the average will be equal to one divided by the recommended student station utilization rate. The number of rooms required of each kind can be obtained by dividing the projected student registration load by the programmed station capacity figure that has been established. Projected student station capacity then is simply a function of the number of rooms required and the number of stations in each room.

Upon completing the projection of capacity requirements, worksheet 6.3 may be used to determine the space requirements associated with the projected special purpose instructional facilities. The worksheet parallels the preceding forms and organizes the analysis by subject code, planning stage and course level. For each facility, the primary space requirements are determined by establishing the unit area per room (a function of the number of stations per room and the unit area allocation criteria suggested in table 6.1) and multiplying this by the number of meeting rooms required as determined in worksheet 6.2. Service space requirements then are calculated by applying the planning ratio for service space to primary space as indicated in table 6.2 to the primary space requirements projected for each facility. Total space requirements are then obtained by simple aggregation of the primary and service space components, and total space requirements at each level are determined by aggregation of the total space requirements associated with each type of facility.[a]

Worksheet 6.4 should be used to summarize the projections of special purpose instructional space requirements, by subject, facility level, space category and planning stage. Worksheet 6.5 is an even more compact summary form which focuses upon the over-all requirements for special purpose instructional space in each department, by planning stage. Simple aggregation of the departmental requirements at each planning stage will yield the estimate of total institutional needs for special purpose instructional space at each planning stage.

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[a] Alternately, the actual projection of service space requirements can be handled as a single calculation dealing with the aggregate primary space projected for each subject field. Total space requirements would then be obtained in a manner paralleling that indicated in the text but would involve only one step: the addition of total primary and service space components.

TABLE 6.1; SPECIAL PURPOSE INSTRUCTIONAL SPACE

Teaching Laboratory Utilization Rates
Recommended by A. W. Baxter, Jr., 1960

	Institution 1	Laboratory Schedule Week in Hours 2	Average Schedule Density Threshold 3	Standard Average Hours per Week per Room 4	Average Student Hours/Week per Station[a] 5
1	University of Colorado	30	27	24	19.2
2	Colorado State University	30	27	23	18.4
3	Colorado State College	30	28	24	19.2
4	Adams State College	30	26	22	17.6
5	Western State College	30	27	24	19.2
6	Southern Colorado State College[b]	30	28	24	19.2
7	Colorado School of Mines	30	25	20	16.0
8	Fort Lewis College[b]	30	28	24	19.2

Source: A. W. Baxter, Jr., Capital Outlay for Higher Education...in Colorado, Report to the Legislative Committee on Education Beyond High School, June, 1960, Tables 6A and 6B.

[a] Baxter does not make recommendations on station utilization rates; this figure assumes an everage of 80% of stations occupied when room is in scheduled use. This figure is 80% of the standard average hours per week per room.

[b] S.C.S.C. taken at same rate as C.S.C.; Fort Lewis at same rate as C.S.C., assuming higher utilization expected from trimester program.

TABLE 6.2; SPECIAL PURPOSE INSTRUCTIONAL SPACE

Recommended Planning Criteria for the Allocation
of Space to the Primary Component of Special Purpose
Instructional Facilities, by Subject and Division

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1100 AGRICULTURAL SCIENCES	
1101 Agronomy		
Lower	40	Soils
Upper	45	Soil chemistry; physics; microbiology; weed control; field crops
Graduate	--	--
1102 Animal Husbandry		
Lower	40	Chemical analysis
	80	Feeding; meat technology; care
Upper	50	Breeding; reproduction; physiology; endocrinology; nutrition
Graduate	--	--
1103 Dairy Husbandry		
Lower	40	Chemical analysis
	80	Feeding; milking methods; animal care
Upper	50	Chemical analysis; nutrition; breeding; physiology of lactation
Graduate	--	--
1104 Dairy Manufacturing		
Lower	--	Basic installation will vary with departmental programs
Upper	--	
Graduate	--	--
1105 Farm Management		
Lower	--	--
Upper	--	--
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1100 AGRICULTURAL SCIENCES (Continued)	
1106 Horticulture		
Lower	30	General; lawn management
Upper	45	Flower arrangement; taxonomy; germination and propagation
Graduate	--	--
1107 Ornamental Horticulture		
Lower		
Upper		see horticulture
Graduate		
1108 Poultry Husbandry		
Lower	35	Genetics
Upper	45	Nutrition; physiology
Graduate	--	--
1111 Forestry and Range Management		
Lower	--	--
Upper	35	--
Graduate	--	--
1112 Watershed Management		
Lower	--	--
Upper	--	--
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1200 BIOLOGICAL SCIENCES	
1201 Biological Sciences		
Lower	35	General; introductory
Upper	--	--
Graduate	--	--
1202 Biology, General		
Lower	35	See Botany and Zoology
Upper	45	See Botany and Zoology
Graduate	60	See Botany and Zoology
1203 Botany		
Lower	35	Elementary; plant anatomy; taxonomy
Upper	45	Morphology; mycology; microtechnique; plant physiology; taxonomy
Graduate	60	Pathology; microtechnique
1204 Zoology		
Lower	35	Introductory; elementary; comparative anatomy; physiology
Upper	45	Vertebrate; invertebrate; cytology; embryology; enzymology; parasitology; histology; morphology; ornithography; ecology; limnology; taxonomy
Graduate	60	--
1205 Anatomy and Histology		
Lower	35	Histology; developmental anatomy
	60	Gross anatomy
Upper	45	Microscopic anatomy; vertebrate morphology
Graduate	60	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1200 BIOLOGICAL SCIENCES (Continued)	
1206 Bacteriology		
Lower	--	--
Upper	45	Serology; virology; pathogenic; immunology; hematology
Graduate	60	--
1207 Biochemistry		
Lower	--	--
Upper	50	Physical organic; nutrition; enzymology
Graduate	60	--
1208 Biophysics		
Lower	--	--
Upper	45	Radiation biology; cellular processes
Graduate	60	--
1209 Entomology		
Lower	35	Elementary; introductory
Upper	45	Physiology; taxonomy; ecology; limnology; toxicology; morphology
Graduate	60	--
1211 Genetics		
Lower	35	Elementary
Upper	45	Cytology; cytogenetics; microbial genetics
Graduate	60	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
1200 BIOLOGICAL SCIENCES (Continued)		
1212 Pathology		
Lower	--	--
Upper	45	Hematology; infectious diseases; pathogenic; pathological anatomy
Graduate	60	--
1213 Plant Pathology		
Lower	35	Elementary; general
Upper	45	Cytology; morphology of fungi; mycology; nematology
Graduate	60	--
1214 Physiology		
Lower	--	--
Upper	45	Pharmacology; chemical physiology
	100	Experimental; animal physiology
Graduate	--	--
1215 Microbiology		
Lower	--	--
Upper	45	Dairy microbiology; bacterial cytology; pathogenic; soil microbiology
Graduate	60	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1300 MATHEMATICAL SCIENCES	
1301 Applied Mathematics		
Lower	--	--
Upper	--	--
Graduate	--	--
1302 Computer Science		
Lower	--	--
Upper	20)	In seminar-classroom. Actual machine area will depend upon size of installation. A typical teaching-oriented installation, excluding office and instructional area, would require 800 square feet.
Graduate	20)	
1303 Mathematics		
Lower	--	--
Upper	--	--
Graduate	--	--
1304 Statistics		
Lower	25	Elementary
Upper	30	Intermediate; advanced
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1400 PHYSICAL SCIENCES	
1401 Physical Science, General		
Lower	35	General science subjects
Upper	--	--
Graduate	--	--
1402 Astrophysics		
Lower	--	--
Upper	50	--
Graduate	60	--
1403 Astrogeophysics		
Lower	40	--
Upper	45	--
Graduate	60	--
1404 Atmospheric Science (including Meteorology)		
Lower	40	--
Upper	50	--
Graduate	60	--
1405 Chemistry		
Lower	40	General; elementary
	45	Quantitative; qualitative; organic
Upper	50	Advanced organic; qualitative; quantitative; biochemistry
	60	Physical chemistry — Too Low need up to 100 sf in Univ. P-Chem.
Graduate	60	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1400 PHYSICAL SCIENCES (Continued)	
1406 Geology		
Lower	40	Elementary; general
Upper	40	Mineralogy; paleontology; crystallography
	50	Stratigraphy; petrology; petrography; mapping; cartography; lithology
Graduate	60	--
1407 Physics		
Lower	40	General; elementary; principles; introductory
Upper	45	Intermediate; electronics; heat; mechanics; optics; modern physics electricity
Graduate	60	Atomic physics
1408 Engineering Physics		
Lower	40	--
Upper	45	--
Graduate	60	--
1409 Astronomy		
Lower	25	--
Upper	50	--
Graduate	60	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1500 ENGINEERING SCIENCES	
1501 Aeronautical		
Lower	--	--
Upper	150	--
Graduate	--	--
1502 Agricultural		
Lower	--	--
Upper	60	Soil and water engineering
	45	Electricity
	115	Farm metal work; shop work
	85	Structures
	150	Farm machinery; equipment
Graduate	--	--
1503 Architectural		
Lower	--	
Upper	--	see architecture
Graduate	--	
1504 Chemical		
Lower	--	--
Upper	150	Unit operations
	60	Physical chemistry
	30	Instrumentation
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
1500 ENGINEERING SCIENCES (Continued)		
1505 Civil		
Lower	--	--
Upper	75-100	Hydraulics; concrete
	60	Soils
	150	Strength of materials
	50	Photogrammetry
Graduate	--	--
1506 Electrical		
Lower	--	--
Upper	75	Circuits
	125	Machines; power engineering
	45	Measurements; control systems; electronics
Graduate	--	--
1507 Geological		
Lower	--	
Upper	--	see Geology
Graduate	--	
1508 Geophysical		
Lower	--	--
Upper	50	Seismology
	45	Electricity; magnetism; electronics; circuitry
	100	Prospecting technology; well logging
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1500 ENGINEERING SCIENCES (Continued)	
1509 Mechanical		
Lower	--	--
Upper	200	Mechanical; manufacturing processes; thermodynamics
	50	Machine shop; machines
Graduate	--	--
1510 Metallurgical		
Lower	--	--
Upper	40	Microscopy
	120	Spectrography
	70	Physical metallurgy
Graduate	--	--
1511 Mining		
Lower	--	--
Upper	125	Unit operations; production
Graduate	--	--
1512 Petroleum		
Lower	--	--
Upper	150	Production
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
1500 ENGINEERING SCIENCES (Continued)		
1513 Petroleum Refining		
Lower	--	--
Upper	150	Unit operations
	100	Chemical processes
Graduate	--	--
1514 General, Engineering Science		
Lower	--	--
Upper	--	--
Graduate	--	--
1515 Industrial		
Lower	--	--
Upper	65	Processes, time and motion
Graduate	--	--
1700 SOCIAL SCIENCES (LABORATORY-ORIENTED)		
1701 Anthropology-Archaeology		
Lower	35	Physical anthropology; analysis of archaeological specimens
Upper	25	Linguistics
	45	Advanced physical anthropology
Graduate	--	--
1702 Geography		
Lower	35	Physical geography
Upper	50	Cartography
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
1700 SOCIAL SCIENCES (LABORATORY-ORIENTED) (Continued)		
1703 Psychology		
Lower	40	Experimental; introductory
Upper	50	Physiological psychology
	45	Learning; perception; advanced experimental
	75	Testing
Graduate	60	--
1704 Sociology		
Lower	--	--
Upper	300	Observation-experimental room[a]
	12	Observation booth station
	75	Interview and testing booths
Graduate	--	--
1705 Behavioral Science		
Lower	--	--
Upper	--	--
Graduate	--	--
1706 Library Science and Bibliography		
Lower	--	--
Upper	50	Library methods
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1800 ARTS AND CRAFTS	
1801 Architecture		
Lower	35	Elementary design; projection; drawing and rendering
Upper	50	Design
	40	Furniture design, interiors
Graduate	--	--
1802 Fine Arts		
Lower	35	Introductory; drawing; painting; materials and techniques
Upper	45	Advanced painting
	50	Sculpture; ceramics; pottery; crafts
Graduate	75	Individual studios
1803 Commercial Arts		
Lower	35	Introductory advertising design
Upper	45	Advanced advertising design
Graduate	--	--
1804 Industrial Arts and Crafts		
Lower	50	Woodworking
	50	Machine shop
Upper	80	Welding, sheetmetal
	40	Electronics
Graduate	--	--
1805 Landscape Architecture		
Lower	--	--
Upper	50	--
Graduate	--	--

Sculpture
[illegible]

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1800 ARTS AND CRAFTS (Continued)	
1806 Music		
Lower	--	N.B. Individual practice room requires 80 square feet; allow 15 square feet per participant for large group practice rooms such as choral, band, orchestral groups.
Upper	--	
Graduate	--	
1807 Planning		
Lower	--	--
Upper	50	--
Graduate	--	--
1808 Engineering Drawing, Graphics, Design		
Lower	35	Drawing; drafting
	30	Engineering drawing
Upper	40	Graphics; design; advanced drafting
Graduate	--	--
	1900 LANGUAGES AND LITERATURE	
1900 Language Laboratories		
Lower)	25	N.B. Booth requires 25 square feet. Recording room requires 75 square feet. Control station with console included in above station criterion.
Upper)		
Graduate)		

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	1900 LANGUAGES AND LITERATURE (Continued)	
1906 Speech and Drama		
Lower	--	N.B. Basic stage and pit setup varies in size with character of theatre; i.e., both size and style. A basic proscenium type stage setup can be accommodated in 2700 square feet. About 300 square feet are required for the orchestra pit. A practice studio stage need not be more than 200 square feet. The service space coefficient applies to total space, excluding seating and theatre lobby area.
Upper	--	
Graduate	--	
	2100 BUSINESS - GENERAL	
2101 Accounting		
Lower)	25	General accounting work
Upper)		
Graduate)		
2103 Commercial Practice, Secretarial		
Lower)	25	Typewriter work; calculator work
Upper)		
Graduate	--	--
2106 Management		
Lower	--	--
Upper	40	Time and motion analysis
Graduate	--	--

(Continued)

6.2 (Continued)

Subject and Division 1	Unit Area Allocation Per Student Station (square feet) 2	Courses 3
	2300 HOME ECONOMICS	
2301 General Home Economics		
Lower	40)	These criteria are across-the-board averages for typical range of home economics courses.
Upper	50)	
Graduate	--)	
2302 Family and Child Development		
Lower	--)	Depends upon whether nursery school is operated and character of programs offered.
Upper	--)	
Graduate	--)	
2303 Clothing and Textiles		
Lower	25	Materials
	40	Textile chemistry
Upper	45	Patternmaking; design; costuming; sewing
Graduate	--	--
2304 Foods and Nutrition		
Lower	40	Food chemistry; elementary nutrition
Upper	50	Nutrition
	60	Food preparation and analysis; experimental cookery
	25	Taste panel
Graduate	--	--

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[a] Typical; could vary in size and might also serve dual function as conference or seminar room.

TABLE 6.3; SPECIAL PURPOSE INSTRUCTIONAL SPACE

Recommended Planning Criteria for the Allocation of Space to the Service Component of Special Purpose Instructional Facilities, by Subject

6.3 (Continued)

Subject 1	ervice Space as Percent of Primary Special prpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large Dpartments 2	Small Departments 3	Large Departments 4	Small Departments 5
1100 RICULTURAL SCIENCES				
1101 Agronomy				
Lower)	-39-		-28-	
Upper)				
Graduate)				
1102 Animal Husbandry				
Lower)	-32-		-24-	
Upper)				
Graduate)				
1103 Dairy Husbandry				
Lower)	-43-		-30-	
Upper)				
Graduate)				
1104 Dairy Manufacturing				
Lower)	-33-		-25-	
Upper)				
Graduate)				
1105 Farm Management				
Lower)	--		--	
Upper)				
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	ervice Space as Percent of Primary Special rpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large partments 2	Small Departments 3	Large Departments 4	Small Departments 5
1100 AGRI ULTURAL SCIENCES (Continued)				
1106 Horticulture	-32-		-24-	
Lower)				
Upper)				
Graduate)				
1107 Ornamental Horticulture	see horticulture			
Lower)				
Upper)				
Graduate)				
1108 Poultry Husbandry	-43-		-30-	
Lower)				
Upper)				
Graduate)				
1111 Forestry and Range Management	-43-		-30-	
Lower)				
Upper)				
Graduate)				
1112 Watershed Management	--		--	
Lower)				
Upper)				
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	vice Space as Percent of Primary Special ose Instructional Area arge rtments 2	Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	Small Departments 5
	IOLOGICAL SCIENCES			
	-32-		-24-	
1201 Biological Sciences				
Lower)	35	39	26	28
Upper)				
Graduate)				
1202 Biology, General				
Lower)	41	27	29	21
Upper)				
Graduate)				
1203 Botany				
Lower)	25	16	20	14
Upper)				
Graduate)				
1204 Zoology				
Lower)	39	25	28	20
Upper)				
Graduate)				
1205 Anatomy and Histology				
Lower)				
Upper)				
Graduate)				

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	 Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	 Small Departments 5
1200 BIOLOGICAL SCIENCES (Continued)				
1206 Bacteriology				
Lower	-47-		-32-	
Upper				
Graduate				
1207 Biochemistry				
Lower	-32-		-24-	
Upper				
Graduate				
1208 Biophysics				
Lower	-32-		-24-	
Upper				
Graduate				
1209 Entomology				
Lower	-32-		-24-	
Upper				
Graduate				
1211 Genetics				
Lower	-32-		-24-	
Upper				
Graduate				

(Continued)

6.3 (Continued)

Subject	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments	 Small Departments	Service Space as Percent of Total Special Purpose Instructional Area Large Departments	 Small Departments
1200 BIOLOGICAL SCIENCES (Continued)				
1212 Pathology				
Lower)	-32-		-24-	
Upper)				
Graduate)				
1213 Plant Pathology				
Lower)	-32-		-24-	
Upper)				
Graduate)				
1214 Physiology				
Lower)	-32-		-24-	
Upper)				
Graduate)				
1215 Microbiology				
Lower)	-32-		-24-	
Upper)				
Graduate)				
1300 MATHEMATICAL SCIENCES				
1301 Applied Mathematics				
Lower)	--		--	
Upper)				
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area: Large Departments 2	Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area: Large Departments 4	Small Departments 5
1300 MATHEMATICAL SCIENCES (Continued)				
1302 Computer Science				
Lower				
Upper				
Graduate	-23-		-19-	
1303 Mathematics				
Lower				
Upper				
Graduate	--		--	
1304 Statistics				
Lower				
Upper				
Graduate	-10-		- 9-	
1400 PHYSICAL SCIENCES				
1401 Physical Science, General				
Lower				
Upper				
Graduate	30	32	23	24
1402 Astrophysics				
Lower				
Upper				
Graduate	30	32	23	24

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	 Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	 Small Departments 5
1400 PHYSICAL SCIENCES (Continued)				
1403 Astrogeophysics				
Lower)	30	32	23	24
Upper)				
Graduate)				
1404 Atmospheric Science (including Meteorology)				
Lower)	30	32	23	24
Upper)				
Graduate)				
1405 Chemistry				
Lower)	35	32	26	24
Upper)				
Graduate)				
1406 Geology				
Lower)	16	30	14	23
Upper)				
Graduate)				
1407 Physics				
Lower)	32	35	24	26
Upper)				
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	Small Departments 5
1400 PHYSICAL SCIENCES (Continued)				
1408 Engineering Physics				
Lower)				
Upper)	30	32	23	24
Graduate)				
1409 Astronomy				
Lower)				
Upper)	30	32	23	24
Graduate)				
1500 ENGINEERING SCIENCES				
1501 Aeronautical				
Lower)				
Upper)	-22-		-18-	
Graduate)				
1502 Agricultural				
Lower)				
Upper)	-22-		-18-	
Graduate)				
1503 Architectural				
Lower)				
Upper)	see architecture			
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	Small Departments 5
	1500 ENGINEERING SCIENCES (Continued)			
1504 Chemical				
Lower)	-22-		-18-	Too Low
Upper)				
Graduate)				
1505 Civil				
Lower)	-22-		-18-	
Upper)				
Graduate)				
1506 Electrical				
Lower)	-22-		-18-	
Upper)				
Graduate)				
1507 Geological				
Lower)		see geology		
Upper)				
Graduate)				
1508 Geophysical				
Lower)	-22-		-18-	
Upper)				
Graduate)				

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	 Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	 Small Departments 5
1500 ENGINEERING SCIENCES (Continued)				
1509 Mechanical				
Lower	-22-		-18-	
Upper				
Graduate				
1510 Metallurgical				
Lower	-22-		-18-	
Upper				
Graduate				
1511 Mining				
Lower	-22-		-18-	
Upper				
Graduate				
1512 Petroleum				
Lower	-22-		-18-	
Upper				
Graduate				
1513 Petroleum Refining				
Lower	-22-		-18-	
Upper				
Graduate				

(Continued)

6.3 (Continued)

Subject	Service Space as Percent of Primary Special Purpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
1500 ENGINEERING SCIENCES (Continued)				
1514 General, Engineering Science				
Lower	--		--	
Upper				
Graduate				
1515 Industrial				
Lower	-22-		-18-	
Upper				
Graduate				
1700 SOCIAL SCIENCES (LABORATORY-ORIENTED)				
1701 Anthropology-Archaeology				
Lower	-22-		-18-	
Upper				
Graduate				
1702 Geography				
Lower	-18-		-15-	
Upper				
Graduate				
1703 Psychology				
Lower	-23-		-19-	
Upper				
Graduate				

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	Service Space as Percent of Primary Special Purpose Instructional Area Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	Service Space as Percent of Total Special Purpose Instructional Area Small Departments 5
1700 SOCIAL SCIENCES (LABORATORY-ORIENTED) (Continued)				
1704 Sociology Lower Upper Graduate	-37-		-27-	
1705 Behavioral Science Lower Upper Graduate	--		--	
1706 Library Science and Bibliography Lower Upper Graduate	-22-		-18-	
1800 ARTS AND CRAFTS				
1801 Architecture Lower Upper Graduate	18	43	15	30
1802 Fine Arts Lower Upper Graduate	32	22	24	18

(Continued)

6.3 (Continued)

Subject	Service Space as Percent of Primary Special Purpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
1800 ARTS AND CRAFTS (Continued)				
1803 Commercial Arts				
Lower	-23-		-19-	
Upper				
Graduate				
1804 Industrial Arts and Crafts				
Lower	-25-		-20-	
Upper				
Graduate				
1805 Landscape Architecture				
Lower	see architecture			
Upper				
Graduate				
1806 Music				
Lower	27	41	21	29
Upper				
Graduate				
1807 Planning				
Lower	see architecture			
Upper				
Graduate				

(Continued)

6.3 (Continued)

Subject	Service Space as Percent of Primary Special Purpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
1800 ARTS AND CRAFTS (Continued)				
1808 Engineering Drawing, Graphics, Design Lower Upper Graduate	11	27	10	21
1900 LANGUAGES AND LITERATURE				
1900 Language Laboratories Lower Upper Graduate	-20-		-17-	
1906 Speech and Drama Lower Upper Graduate	-19-		-33-	
2100 BUSINESS - GENERAL				
2101 Accounting Lower Upper Graduate	--		--	

(Continued)

6.3 (Continued)

Subject 1	Service Space as Percent of Primary Special Purpose Instructional Area Large Departments 2	Service Space as Percent of Primary Special Purpose Instructional Area Small Departments 3	Service Space as Percent of Total Special Purpose Instructional Area Large Departments 4	Service Space as Percent of Total Special Purpose Instructional Area Small Departments 5
2100 BUSINESS - GENERAL (Continued)				
2103 Commercial Practice, secretarial				
Lower)	-14-		-12-	
Upper)				
Graduate)				
2106 Management				
Lower)	-18-		-15-	
Upper)				
Graduate)				
2300 HOME ECONOMICS				
2301 General Home Economics				
Lower)	-37-		-27-	
Upper)				
Graduate)				
2302 Family and Child Development				
Lower)	-39-		-28-	
Upper)				
Graduate)				
2303 Clothing and Textiles				

6.3 (Continued)

Subject	Service Space as Percent of Primary Special Purpose Instructional Area		Service Space as Percent of Total Special Purpose Instructional Area	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
2300 HOME ECONOMICS (Continued)				
2304 Foods and Nutrition				
Lower	-33-		-25-	
Upper				
Graduate				

PLATE 6-1; TEACHING LABORATORY SPACE
TYPICAL ELEMENTARY BIOLOGY FACILITIES

25 SQ. FT. PER STATION

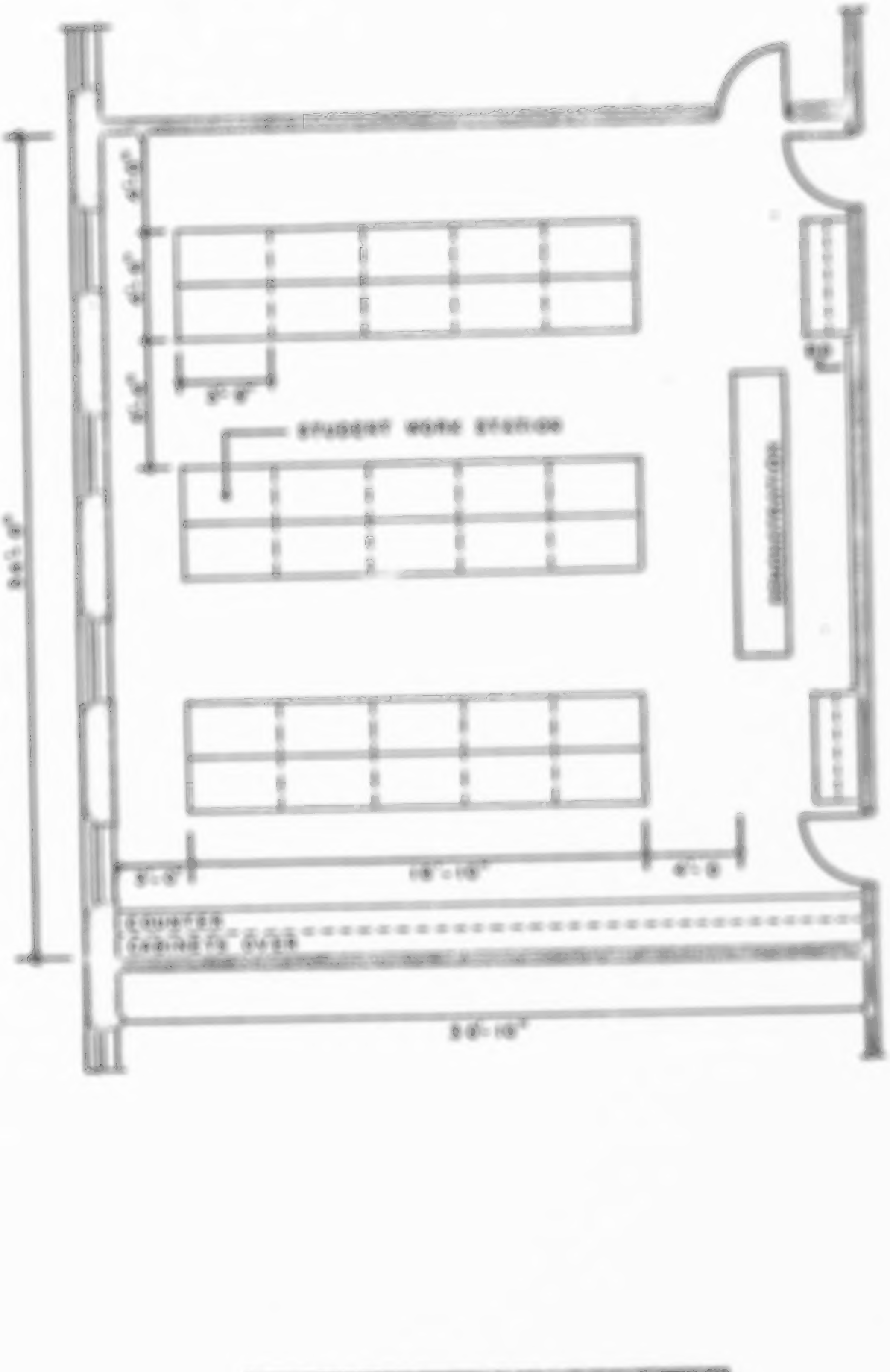

STUDENT WORK STATION
DEMONSTRATION
COUNTER
CABINETS OVER
5'-0"
18'-10"
30'-10"
0 1 2 3 4 5 10 20 FT.

PLATE 6-2; TEACHING LABORATORY SPACE
TYPICAL ELEMENTARY CHEMISTRY FACILITIES

[illegible] SQ. FT. PER STATION

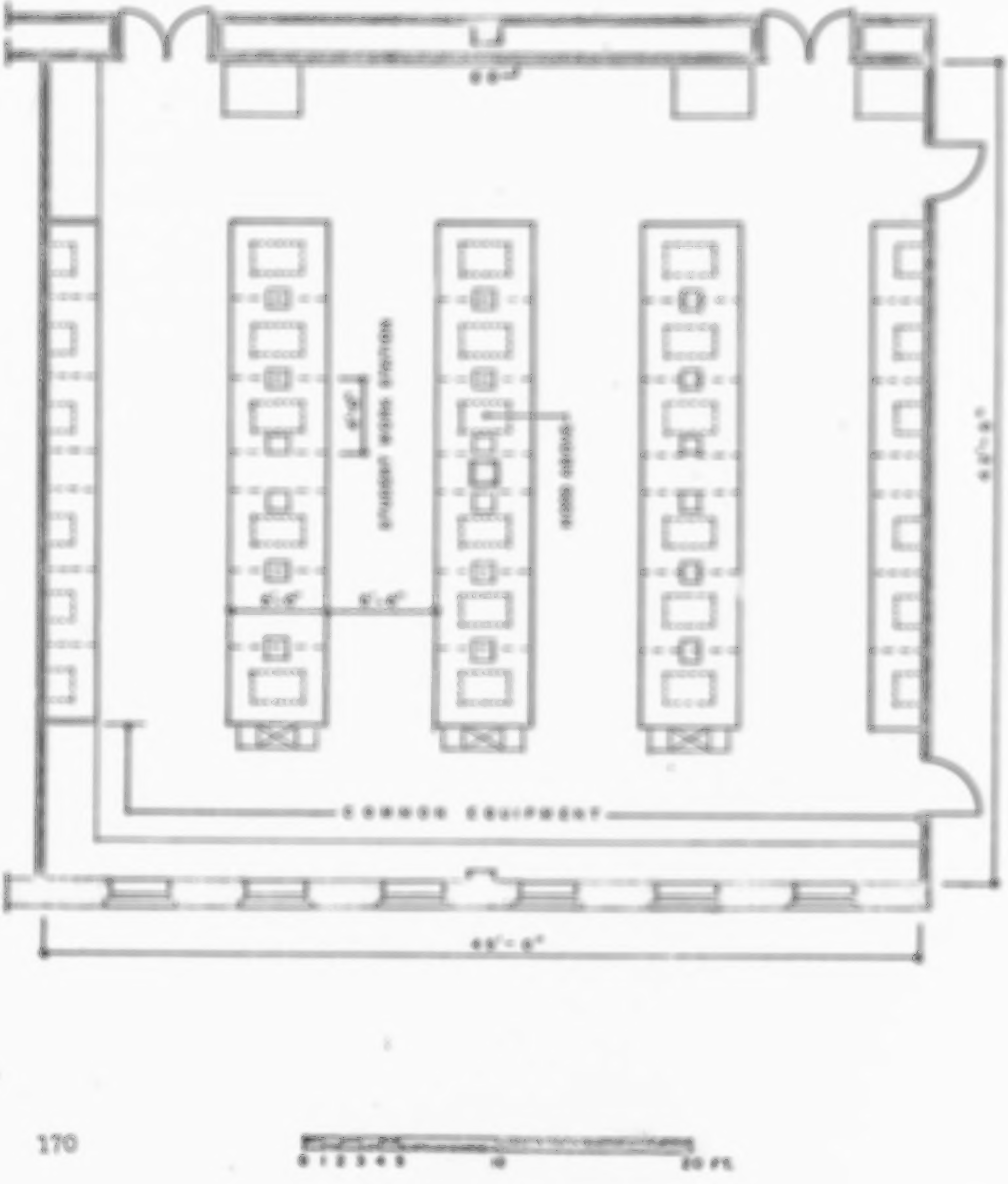
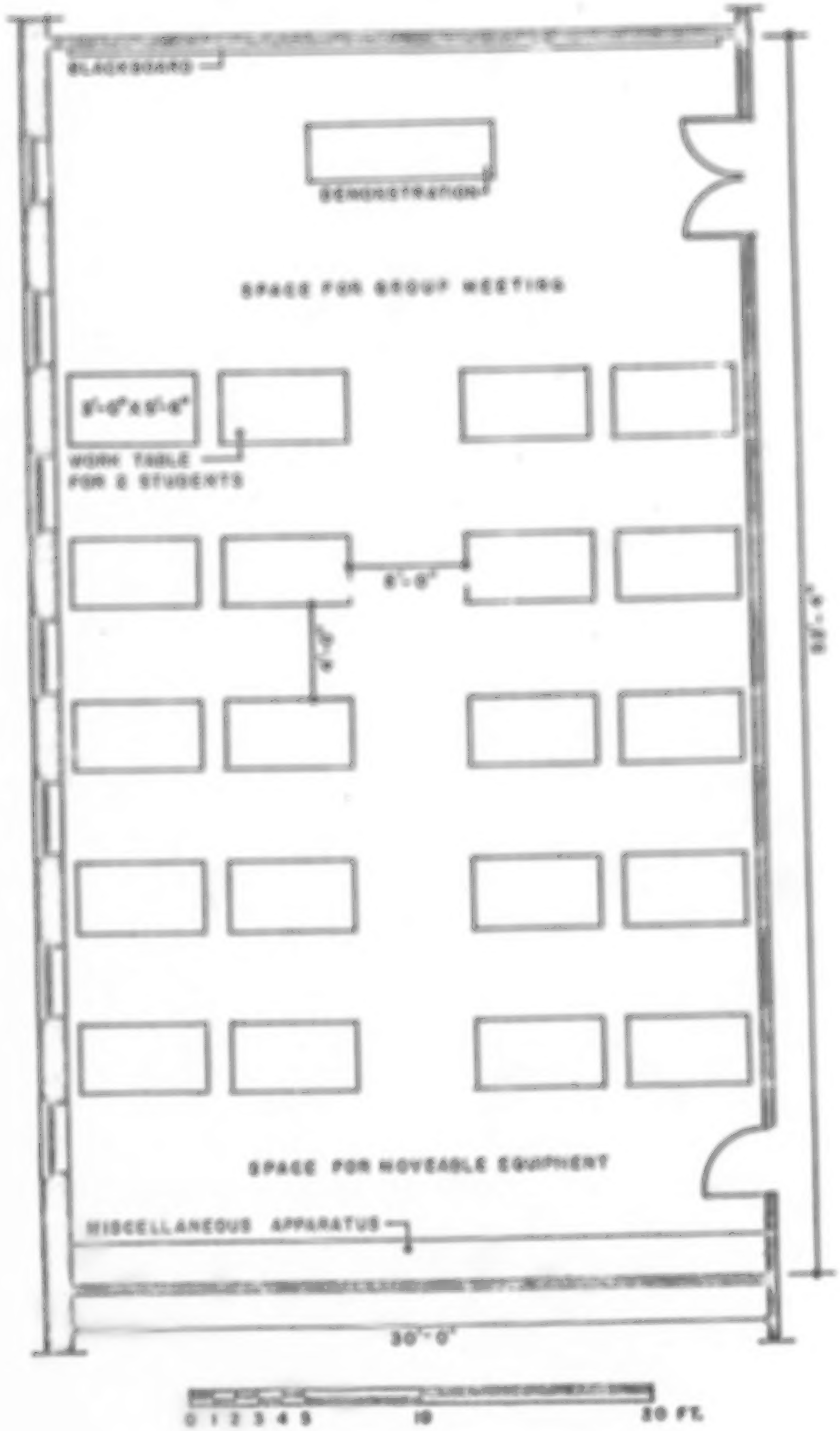

COMMON EQUIPMENT
0 1 2 3 4 5
10
20 FT.

PLATE 6-3; TEACHING LABORATORY SPACE
TYPICAL ELEMENTARY PHYSICS FACILITIES

40 SQ. FT. PER STATION


BLACKBOARD
DEMONSTRATION
SPACE FOR GROUP MEETING
5'-0" x 2'-6"
WORK TABLE
FOR 2 STUDENTS
5'-0"
4'-0"
32'-6"
SPACE FOR MOVEABLE EQUIPMENT
MISCELLANEOUS APPARATUS
30'-0"
0 1 2 3 4 5
10
20 FT.

WORKSHEET 6.1: SPECIAL PURPOSE INSTRUCTIONAL SPACE

Room and Student Station Utilization Criteria to Be Used in Projecting Capacity Requirements in All Special Purpose Instructional Facilities

Institution______________ Department______________ Subject Code ______________

	Item	Planning Stage I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1 7	Normal length of teaching week for special purpose instructional facilities (hours)						
2	Room utilization criteria:						
3	Room periods per week: number						
4	Room periods per week: percent						
5	Student station utilization rate: percent						
6	Capacity utilization coefficient:						
7	Student periods per station per week: number						
8	Student periods per station per week: percent						

DATA SOURCES:

Line 1:	Policy planning assumption	Line 5:	Association policy
Line 2:	No entry	Line 6:	No entry
Line 3:	Baxter	Line 7:	Line 5 x line 3
Line 4:	Line 3 ÷ line 1	Line 8:	Line 5 x line 4

PREPARED:	APPROVED	SUBMITTED:
By______________	By______________	By______________
Date______________	Date______________	Date______________

TECHNICAL NOTES:

The institution may find it useful to distinguish among facilities by level of instruction. In this instance, a separate worksheet would be completed to describe the utilization criteria to be applied at, say, lower division, upper division, and graduate level facilities.

WORKSHEET 6.2: SPECIAL PURPOSE INSTRUCTIONAL SPACE

Projection of Room and Student Station Capacity Requirements
in Special Purpose Instructional Facilities

Institution__________ Department__________ Subject Code_____ Planning Stage_____ Level_____

	Facility No.	Courses to be Taught in Facility	Projected Student Registrations	Room Size		Number of Rooms Required	Projected Student Station Capacity
				Preferred Class Size (students)	Programmed Room Size (stations)[a]		
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

(Continued)

WORKSHEET 6.2: (Continued)

	Facility No. 1	Courses to be Taught in Facility 2	Projected Student Registrations 3	Room Size: Preferred Class Size (students) 4	Room Size: Programmed Room Size (stations)[a] 5	Number of Rooms Required 6	Projected Student Station Capacity 7
11							
12							
13							
14							
15							
16	Total						

DATA SOURCES:

Col. 1: Numerical sequence
Col. 2: Policy planning assumption
Col. 3: Worksheet series 3.9
Col. 4: Worksheet series 3.9 and planning analyst
Col. 5: Col. 4 modified by planning analyst
Col. 6: Col. 3 ÷ col. 5
Col. 7: Col. 6 x Col. 5

PREPARED:	APPROVED:	SUBMITTED:
By________	By________	By________
Date________	Date________	Date________

TECHNICAL NOTES:

[a] The programmed room size can be obtained by dividing the entry in Col. 4 for preferred class size by the recommended student station utilization rate.

WORKSHEET 6.3: SPECIAL PURPOSE INSTRUCTIONAL SPACE

Projection of Space Required in Special Purpose Instructional Facilities

Institution__________ Department__________ Subject Code_____ Planning Stage_____ Level_____

			Unit Area Allocation Criteria			Program Area			
	Facility No. 1	Room Size (number of stations) 2	Per Student Station (square feet) 3	Per Room (square feet) 4	Meeting Rooms Required 5	Primary Space Requirements (square feet) 6	Planning Ratio* Service Space/ Primary Space 7	Service Space Requirements (square feet) 8	Total Space Requirements (square feet) 9
1									
2									
3									
4									
5									
6									
7									
8									
9									

(Continued)

WORKSHEET 6.3: (Continued)

			Unit Area Allocation Criteria			Program Area			
	Facility No.	Room Size (number of stations)	Per Student Station (square	Per Room feet)	Meeting Rooms Required	Primary Space Requirements (square feet)	Planning Ratio: Service Space/ Primary Space	Service Space Requirements (square	Total Space Requirements feet)
	1	2	3	4	5	6	7	8	9
10									
11									
12									
13									
14	.								
15	:								
16	Total								

DATA SOURCES:

Col. 1: Worksheet series 6.2
Col. 2: Worksheet series 6.2
Col. 3: Table 6.2
Col. 4: Col. 2 x Col. 3
Col. 5: Worksheet series 6.2
Col. 6: Col. 5 x Col. 4
Col. 7: Table 6.3.
Col. 8: Col. 7 x Col. 6
Col. 9: Col. 6 + Col. 8

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

WORKSHEET 6.4; SPECIAL PURPOSE INSTRUCTIONAL SPACE

Summary of Space Required in Special Purpose Instructional Facilities at Selected Planning Stages, by Level and Primary-Service Space Classification

Institution____________ Department____________ Subject Code____________

		Planning Stage					
	Facility Level and Space Category	I	II	III	IV	V	VI
				(square feet)			
	1	2	3	4	5	6	7
1	Lower division:						
2	Primary space						
3	Service space						
4	Subtotal						
5	Upper division:						
6	Primary space						
7	Service space						
8	Subtotal						
9	Graduate:						
10	Primary space						
11	Service space						
12	Subtotal						
13	All special purpose instructional facilities:						
14	Primary space						
15	Service space						
16	Total						

(Continued)

WORKSHEET 6.4 (Continued)

DATA SOURCES:

Line 1:	No entry	Line 9:	No entry
Line 2:	Worksheet series 6.3, Col. 6	Line 10:	Worksheet series 6.3, Col. 6
Line 3:	Worksheet series 6.3, Col. 8	Line 11:	Worksheet series 6.3, Col. 8
Line 4:	Worksheet series 6.3, Col. 9	Line 12:	Worksheet series 6.3, Col. 9
Line 5:	No entry	Line 13:	No entry
Line 6:	Worksheet series 6.3, Col. 6	Line 14:	Sum of lines 2, 6 and 10
Line 7:	Worksheet series 6.3, Col. 8	Line 15:	Sum of lines 3, 7 and 11
Line 8:	Worksheet series 6.3, Col. 9	Line 16:	Sum of lines 4, 8 and 12

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

WORKSHEET 6.5; SPECIAL PURPOSE INSTRUCTIONAL SPACE

Summary of Space Required in Special Purpose Instructional Facilities at Selected Planning Stages, by Department

Institution____________________________

		Planning Stage					
	Department	I	II	III	IV	V	VI
				(square feet)			
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	Total						

(Continued)

WORKSHEET 6.5 (Continued)

DATA SOURCES:

All data are from Worksheet series 6.4

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

CHAPTER 7

OFFICE SPACE

Projection of office space requirements is based upon the projections of faculty and staff requirements carried out in Chapter 4. These personnel projections must now be analyzed in terms of the work stations required for carrying out the activities associated with each personnel category to determine the office-type building area required. Implementation of this portion of the Manual will depend heavily upon the policies and patterns of the various institutions, and the methods and worksheets used will have to be adapted by each institution to its individual needs.

A. Primary Office Space (Staff Work Stations)

In determining the requirements for primary office-type space, the procedural steps may take the following form:

1. Establishment of unit area allocation criteria;
2. Determination of the aggregate number of space units of various types required, and the implied area needs;
3. Determination of the locational characteristics of the complex of required space, and the implied area needs.

The first step is consistent with the general planning approach of applying uniform criteria for work station space requirements based upon the functional requirements of the space occupant and independent of his employment position or departmental affiliation. To assist in this regard, table 7.1 provides illustrative unit space allocation criteria. The criteria are those that we and other planners have found useful. For the single occupancy offices, the figures refer to net office space requirements, exclusive of such service elements as files, bookcases, etc.; for the units located in multiple occupancy arrangements, the figures include an allowance for immediate circulation and equipment requirements.

As the table suggests, a distinction should be made between office units that are single occupancy or private in nature and those that are in multiple occupancy status. For example, in a multiple occupancy arrangement two or more graduate students or clerks may share space in a single room. The criteria reflect a basic room area module of 120 square feet. The multiple occupancy units are readily adaptable to combination in such a way as to make efficient use of the basic room module. Thus, the basic S-3 unit can also be used to accommodate two M-2 units or three M-3 units.

The work station criteria can, of course, be modified or increased in number and variety if necessary. The 120 square foot basic office unit, however, is one found demonstrably satisfactory for almost all faculty offices except those in which group instruction of over three students is included among the functions that the office space unit must accommodate. Normally, when the size of the small student discussion group is such that a space larger than 120 square feet is required for a faculty office, the group should meet in a classroom or seminar room. Where this cannot be the case for reasons of educational policy, the basic faculty office unit must be larger than 120 square feet.

The second step is the development of the inventory of office unit requirements. The starting point here is the classification of personnel by broad position category for each department (see Chapter 4). By having personnel and office unit requirements listed on the same sheet, a control device is made available to check that total office unit requirements do not exceed the number of personnel that are to occupy these units. Worksheet 7.1 may be used for this purpose. An examination of the worksheet will show that the personnel classification used for determining office space requirements has been elaborated to reflect budgeted and non-budgeted personnel. This is done for two reasons: first, to underscore the cost of a policy decision to provide space for non-budgeted personnel (e.g., graduate students, students in honors programs, visiting firemen); second, to make sure that the space required to accommodate non-budgeted staff, where such space is to be provided, is accounted for accurately in the estimates.

A third step in the development of the information required at each planning stage would involve the reorganization of the office capacity projections to reflect the general locational distribution of the office work station units. That is, some units should be in predominantly office space complexes; e.g., faculty offices, clerical offices, etc. Other units should be in laboratory areas; e.g., graduate students, laboratory assistants. Still other units might be located in library space (e.g., carrels), laboratory service space (e.g., shops or preparation areas), or other space (e.g., stockrooms). However, this step may be deferred to a later stage of the programming study.

It should be noted that departmental estimates of office capacity requirements can be aggregated by whatever groups of departments are deemed relevant. Thus, social science or humanities departments might be aggregated for purposes of determining the overall number of offices necessary to accommodate them as a group. The needs for new structures or the adequacy of existing structures can more readily be evaluated for those departmental groups that are primarily office space users.

B. Service Space

Naturally, these reference criteria do not by themselves permit estimation of that portion of departmental office space that falls in the "service" or "auxiliary" category. Included in the service category are such elements as files, reception areas, supplies, conference areas, and so on. The basic allocations to staff stations, however, can be used as a point of departure.

Two approaches to auxiliary office space needs are possible. One approach, that for which a computational format has been provided in this Manual, involves the use of rule-of-thumb estimates of the ratio of office service space to a) total office space requirements or b) total primary office space requirements. In either case, once primary office space requirements are estimated, the service space needs are readily calculated by use of the appropriate planning ratio. Although the proportions will vary with the size and character of departmental office operations, experience indicates that office service elements account for approximately 20 percent of total office space needs. That is, for every 100 square feet of office space, 80 square feet are used for staff work stations and 20 square feet fall into the supporting space category. Naturally, greater sophistication is possible even when using rule-of-thumb measures. Thus, different factors should be used for academic and non-academic departments. Within these categories, further subclassifications by size and character of operations are possible. The procedure that is ultimately adopted will probably depend upon the resources and time available for making more detailed estimates. Table 7.2 summarizes some of the rule-of-thumb factors worked up from experience with more detailed studies.

The second approach is optional and no computational procedure is outlined here. It would involve studies in greater depth of the office service space category. In the same way that activity levels (in the form of staff estimates) are used as the basis for calculating primary office space needs, appropriate indexes of need would be used for calculating the various service space elements. Thus filing, conference, and storage space needs would each be projected only after initially studying the intensity and character of the needs for each element. Then the estimate of the number of units needed of each service space component (whatever the relevant form that these units may be measured in) would be combined with the appropriate unit space allocation criterion to arrive at the estimate of total space needed to accommodate that specific office service element.

Consider, for example, file space. Estimation of space requirements would require a projection of the number of file drawers required at some specified level of departmental activity. This would in turn depend upon the rates at which records are accumulated, record retention policies, and the number of file drawers required for the quantity of records that have been calculated to require housing at the subject planning date. If consideration is restricted for purposes of this discussion to letter and legal files, the next step is converting the file drawers estimate into estimates of the number of file cabinets needed. This will, of course, vary with whether 2-, 3-, 4-, or 5-drawer file cabinets are used. The average floor space requirement per drawer declines as the cabinet increases in drawer capacity; and, from a space planning viewpoint, the 5-drawer cabinet is to be preferred. Experience indicates that letter-size file cabinets require 10 square feet of space, while legal-size cabinets must be assigned 12 square feet. Combining the estimated requirement for file cabinets (letter-size and legal-size separately) with the appropriate file cabinet unit space allocation criterion results in the total file space requirement estimate.

An analagous procedure can be developed for each component of the office service space complex. The procedures for determining the activity levels or unit requirements will not be discussed any further at this juncture. Clearly, these can be of greater or lesser complexity. However, recommended unit space allocation criteria for selected service space elements are enumerated in table 7.3. They can be incorporated into an office space planning model even if the procedure for estimating the number of units required must be limited to relatively simple organization. Further observations on this subject will be offered if the detailed programming approach is adopted.

C. Outline of Procedure

Worksheet 7.1 should be used for indicating the office capacity requirements of each department at each planning stage. The worksheet calls for the use of information developed in Chapter 4 regarding the number of personnel projected for each department. Within each personnel category, a specification should then be made of the number of office work stations required, classified by type of station. That is, the number and kind of single occupancy offices and the number and kind of work stations in multiple occupancy offices should be indicated for each staff category. Aggregation will yield the figures for the total number and distribution of work stations of various types required for each department.

In worksheet 7.2, the total office space requirements for each department may be calculated. The worksheet calls for the separate determination of primary and service space components. Drawing upon the data developed in worksheet 7.1, the number of different types of office work stations required may be enumerated. Each type of station is then multiplied by the appropriate unit area allocation per station suggested in table 7.1. This yields the aggregate program area requirements for primary office work stations, classified by type of station. Simple aggregation of these figures will yield total primary space requirements for office space. By then applying the planning ratio for service space to primary space indicated in table 7.2, the amount of service space required to supplement the primary office space allocation can be determined. Aggregation of the primary and service space components will yield the total space requirements for the department at the specified planning stage.

Worksheet 7.3 is to be used for summarizing the institution's office area requirements at the specified planning stage, broken down by department and program area classification (primary, service, total). Aggregation will yield the total office space requirements projected for the specified planning stage.

Finally, worksheet 7.4 may be used to enumerate all departments and summarize projected office space requirements at each planning stage.

TABLE 7.1; OFFICE SPACE

Recommended Planning Criteria for the Allocation of Space to Staff Work Stations (or the Primary Component) in Office-Type Facilities

Unit Category 1	Unit Area Allocation Criteria (square feet) 2	Staff Category 3
	Single Occupancy Office Station	
Unit S-1	300	Faculty and other professional: e.g., president; vice president, dean
Unit S-2	200	Faculty and other professional: e.g., chairman, academic or research department; director, major administrative department
Unit S-3	120 150	Faculty and other professional: e.g., research scientist; director of small administration department; *professional staff in administration* Supporting technical: e.g., plant maintenance supervisor Supporting clerical: e.g., secretary to dean; office manager
	Multiple Occupancy Office Station	
Unit M-1	80-90 75	Faculty and other professional: e.g., accountant Supporting technical: e.g., foreman Supporting clerical: e.g., bookkeeper; office manager
Unit M-2	60-65 75	Supporting clerical: e.g., clerk-typist
Unit M-3	40-60 50	Faculty and other professional: e.g., teaching assistant Supporting technical: e.g., laboratory research assistant; data analyst Supporting clerical: e.g., statistical clerk Other: e.g., graduate student

TABLE 7.2; OFFICE SPACE

Recommended Planning Criteria for the Allocation of Space to the Service Component of Office Facilities; Planning Ratios, Office Service Space to Total and Primary Office Space

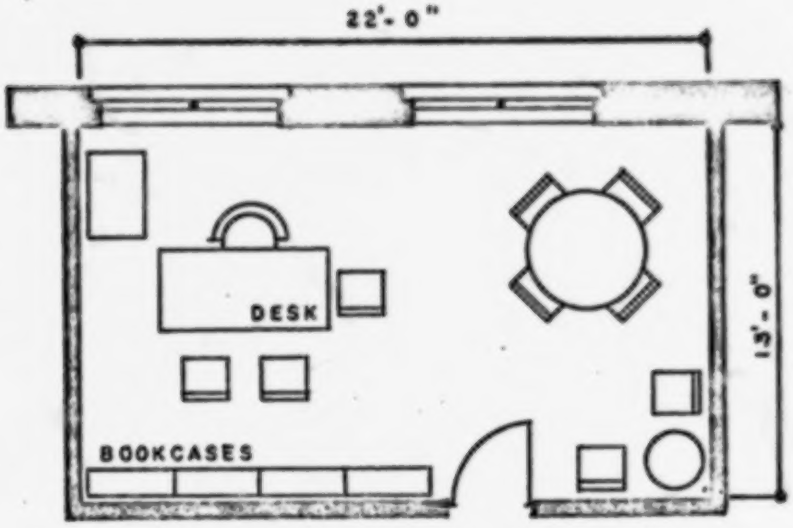
		Service Space	
	Space Category 1	As Ratio to Primary Space 2	As Ratio to Total Space 3
1	All types of departments	.25	.20
2	Academic departments	.19	.16
3	Administrative departments	.76	.43
4	Number of work stations		
5	Academic departments		
6	0-9	.46	.31
7	10-19	.20	.17
8	20-29	.19	.16
9	30-49	.19	.16
10	50-74	.16	.14
11	75 and over	.16	.14
12	Administrative departments		
13	0-9	.96	.49
14	10-29	.90	.47
15	30 and over	.37	.27

TABLE 7.3; OFFICE SPACE

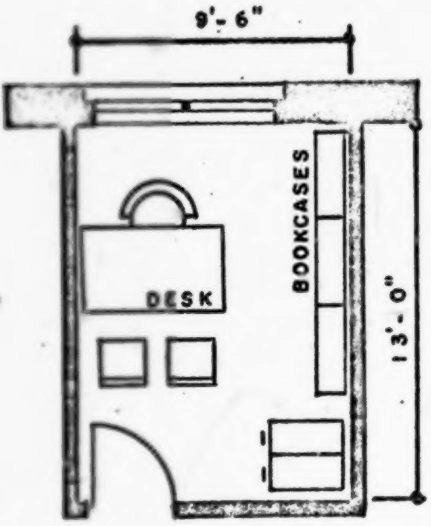
Illustrative Unit Area Allocation Criteria for Selected Service Elements in Office-Type Facilities

Item 1	Dimensions (l x w) 2	Unit Area Allocation Criteria (square feet) 3
Files:		
Letter	2'6" x 1'3"	10
Legal	2'6" x 1'6"	12
Bookcase	3'0" x 1'0"	12
Supply cabinet	3'0" x 1'6"	14
Coat rack	4'3" x 1'4"	19
Worktable	5'0" x 2'6"	39
Side chair	1'6" x 1'6"	7
Typewriter stand	34" x 18"	21
Safe	3'6" x 2'6"	50
Keypunch	2'7" x 2'4"	28

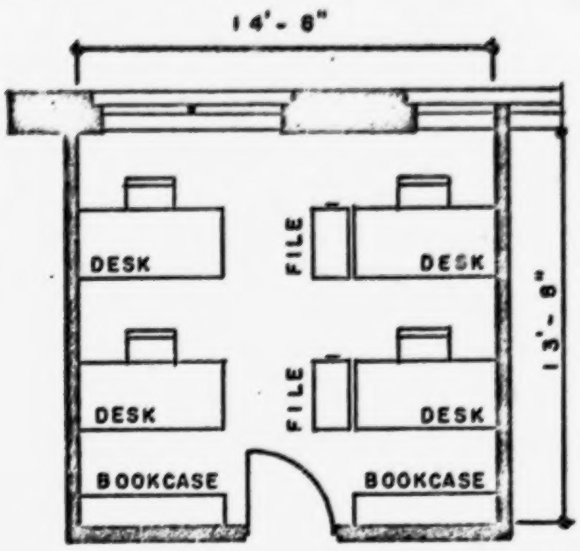
PLATE 7-1, OFFICE SPACE
TYPICAL OFFICE WORK STATION CRITERIA


22'- 0"
DESK
BOOKCASES
13'- 0"

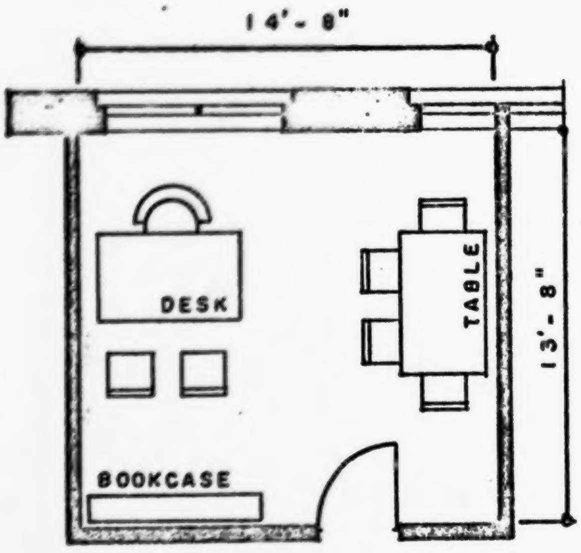
UNIT S-1 300 SQ. FT.


9'- 6"
DESK
BOOKCASES
13'- 0"

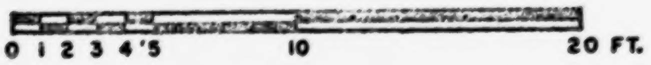
UNIT S-3 120 SQ. FT.


14'- 8"
DESK
FILE
DESK
DESK
FILE
DESK
BOOKCASE
BOOKCASE
13'- 8"

UNIT M-3 50 SQ FT PER STATION


14'- 8"
DESK
TABLE
BOOKCASE
13'- 8"

UNIT S-2 200 SQ. FT.


0 1 2 3 4 5
10
20 FT.

WORKSHEET 7.1; OFFICE SPACE

Projection of Work Station Capacity Requirements for Office-Type Accommodations, by Staff Category and Type of Work Station

Institution ____________ Division ____________ Department ____________ Planning Stage ____________

			Number of Office Work Stations Required						
	Staff Category	Number of Personnel	Single Occupancy			Multiple Occupancy			Total, Single and Multiple Occupancy
			S-1	S-2	S-3	M-1	M-2	M-3	
	1	2	3	4	5	6	7	8	9
1	Budgeted:								
2	Faculty and other professional:								
3	Faculty								
4	Other professional								
5	Student assistants								
6	Supporting technical								
7	Supporting clerical								
8	Other								
9	Non-budgeted:								
10	Graduate students								
11	Other								
12	Total								

(Continued)

WORKSHEET 7.1 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 4.5 and 4.6 and planning analyst
Col. 2: Worksheet series 4.5 and 4.6
Col. 3: Policy planning assumption
Col. 4: Policy planning assumption
Col. 5: Policy planning assumption
Col. 6: Policy planning assumption
Col. 7: Policy planning assumption
Col. 8: Policy planning assumption
Col. 9: Sum of columns 3-8

Line 1: No entry
Line 2: No entry
Line 3: See above reference for columns 2-8
Line 4: See above reference for columns 2-8
Line 5: See above reference for columns 2-8
Line 6: See above reference for columns 2-8
Line 7: See above reference for columns 2-8
Line 8: See above reference for columns 2-8
Line 9: No entry
Line 10: See above reference for columns 2-8
Line 11: See above reference for columns 2-8
Line 12: Sum of lines 3-8 and 10-11

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

WORKSHEET 7.2; OFFICE SPACE

Projection of Space Required in Office-Type Accommodations, by Type of Work Station and Primary-Service Space Classification

Institution_______________ Department___________ Planning Stage___________

	Space Category 1	Number of Stations Required 2	Unit Area Allocation per Station (square feet) 3	Program Area (square feet) 4
1	Primary space:			
2	Single-occupancy units:			
3	S-1			
4	S-2			
5	S-3			
6	Subtotal			
7	Multiple-occupancy units:			
8	M-1			
9	M-2			
10	M-3			
11	Subtotal			
12	Total primary space requirements			
13	Service space:			
14	Planning ratio: service space/primary space			
15	Service space requirements			
16	Total space requirements			

(Continued)

WORKSHEET 7.2 (Continued)

DATA SOURCES:

Col. 1: Planning analyst
Col. 2: Worksheet 7.1

Line 1: No entry
Line 2: No entry
Line 3: Worksheet 7.1
Line 4: Worksheet 7.1
Line 5: Worksheet 7.1
Line 6: Line 3 + line 4 + line 5
Line 7: No entry
Line 8: Worksheet 7.1

Col. 3: Table 7.1, Col. 2
Col. 4: Col. 2 x Col. 3

Line 9: Worksheet 7.1
Line 10: Worksheet 7.1
Line 11: Line 8 + line 9 + line 10
Line 12: Line 6 + line 11
Line 13: No entry
Line 14: Table 7.2, Col. 2
Line 15: Line 14 x line 12
Line 16: Line 12 + line 15

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 7.3; OFFICE SPACE

Summary of Space Required in Office-Type Accommodations by Department and Primary-Service Space Classification

Institution________________ Division__________ Planning Stage________

		Program Area		
	Department	Primary Space	Service Space (square feet)	Total Space
	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17	Total			

(Continued)

WORKSHEET 7.3 (Continued)

DATA SOURCES:

All data are from worksheet series 7.2.

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

WORKSHEET 7.4; OFFICE SPACE

Summary of Space Required in Office-Type Accommodations at Selected Planning Stages, by Department

Institution____________________ Division____________________

		Planning Stage					
		I	II	III	IV	V	VI
	Department			(square feet)			
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17	Total						

(Continued)

WORKSHEET 7.4 (Continued)

DATA SOURCES:

All data are from worksheet series 7.3.

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

CHAPTER 8

RESEARCH SPACE

The determination of research facilities required by each institution must correspond with the institutional function in research defined in the Program for the General Differentiation and Coordination of Functions Among the State Supported Institutions of Higher Education in Colorado, developed by the Association in 1962. Generally, this document intends the concentration of organized research activities and graduate work at the two universities and the School of Mines, except for graduate and research programs in education at other institutions. However, the faculties -- especially in the sciences -- at all institutions must be given the opportunity to carry on individual research work. Each institution must therefore determine the number of faculty members who will be provided individual research space in the various sciences. Highly specialized and expensive research installations which should not be duplicated at more than one institution in the state will be coordinated through the Association, pursuant to the special emphasis of function at the university-type institutions.

The procedure for estimating research facilities recognizes three broad space components: a) individual work space for faculty and professional research personnel and students engaged in research; b) space for large scale specialized equipment and technical services used in supporting research programs; and c) auxiliary service areas required to support research work.

A. Staff Project Research Space

Table 8.1 lists the recommendations for unit area allocations to personnel engaged in research in selected subject matter areas. Several points should be noted. First, the criteria are typical, and cannot be expected to work without exception at every institution. Second, there is considerable uniformity in the criteria for allocating space per individual work station. This derives from a human engineering phenomenon; i.e., the amount of bench space or work area a person can utilize effectively is a function of the physical limitations that characterize all individuals. This implies that wherever the individual is not the dominant element on the research space scene, as is the case occasionally in engineering processes or large animal studies, the development of research space estimates cannot be based upon standards that are oriented towards human characteristics only. Third, in a few broad discipline areas the service space coefficient is expressed as a uniform percentage of total research space, reflecting the wide range of variation that is possible in organizing research activities in these subjects. For example, sometimes, the research space is dominated by equipment; at other times equipment may be miniaturized and the human being is the dominant factor.

With these comments in mind, the unit area criteria should be treated as averages per person, valid in aggregate totals but subject to considerable variation in actual design of research facilities.

B. Large Scale Equipment and Technical Services

Research facilities not directly related to individual work area requirements must be dealt with separately, with area determined by the nature of the facility. Among the types of facilities requiring this special treatment are the CSU hydraulics laboratory, certain parts of the School of Mines metallurgy laboratory, and the cyclotron at the University of Colorado. Institutions which participated in the 1962 National Science Foundation study of projected scientific and engineering physical facility and apparatus needs may use data compiled for that study. Only those facilities should be listed which are in themselves primary pieces of equipment or of a nature not normally included in individual-oriented research laboratories. Since such facilities vary widely in character, an enumeration of recommended physical planning criteria cannot be developed.

C. Service Space

Research activities in the sciences and engineering usually require extensive supporting area for shops, storage, stock rooms, animal rooms, and the like. In this procedure, the service area requirements are determined generally as an incremental percentage of the primary research area for a given subject field. The recommended percentage allowances for service space are listed in table 8.2.

D. Outline of Procedure

Worksheet 8.1 permits the computation of staff project research area requirements according to the number of persons -- faculty, professional research persons, and students -- expected to be engaged in research. The number of persons should be derived from the faculty-staff and graduate student projections for the given subject fields carried out in previous portions of the study. The institution must determine and be able to justify the number of faculty, professional staff and students for whom research space is to be provided. Since service space is computed as a function of the allocation to the primary component of research space, the service space portion of staff project research space is projected directly on this worksheet.

Worksheet 8.2 is analogous to the preceding worksheet, but deals with the space generated by the need for large scale specialized equipment and technical services in the research program. After enumerating the items involved and the space required to accommodate them, the auxiliary service space needs are calculated as a function of the primary research space allocation.

Worksheets 8.3 and 8.4 provide for summary statements regarding research space requirements. For each department and at each planning stage, the former shows the amount of primary and service space associated with staff project activities, large scale equipment and technical services, and both combined. The latter provides for an enumeration of each department's research space needs at each planning stage.

It should be noted that the worksheets focus upon the research space as a functional category. In this sense, it makes little difference whether the research activity is sponsored or university-supported, conducted in university installations or in on-campus space owned by non-university agencies. In short, the emphasis is on the aggregation of total research space requirements on campus.

However, each worksheet makes provision for a departmental designation. By sorting processes, the research space allocations associated with various groups of administrative units can be identified. Thus, although the emphasis is on research space requirements in the functional sense, this will not preclude the identification of who controls the space and, to a lesser extent, who the sponsoring agency is.

TABLE 8.1; RESEARCH SPACE

Recommended Planning Criteria for the Allocation of Space to Staff Project Component of Primary Research Facilities, by Subject

Note: Areas much too Low for univ.
unless Equipment space added.

TLH

TABLE 8.1 (Continued)

Subject	Unit Area Allocation per Station: Faculty and Professional (square feet)	Unit Area Allocation per Station: Student (square feet)
1	2	3
1100 AGRICULTURAL SCIENCES		
1101 Agronomy	110	70
1102 Animal Husbandry	120	80
1103 Dairy Husbandry	110	70
1104 Dairy Manufacturing	--	--
1105 Farm Management	--	--
1106 Horticulture	110	70
1107 Ornamental Horticulture	110	70
1108 Poultry Husbandry	110	70
1111 Forestry and Range Management	100	60
1112 Watershed Management	--	--
1200 BIOLOGICAL SCIENCES		
1201 Biological Science	--	--
1202 Biology, General	110	70
1203 Botany	110	70
1204 Zoology	110	70
1205 Anatomy and Histology	110	70
1206 Bacteriology	110	70
1207 Biochemistry	110	70
1208 Biophysics	110	70
1209 Entomology	110	70
1211 Genetics	110	70
1212 Pathology	110	70
1213 Plant Pathology	110	70
1214 Physiology	120	80
1215 Microbiology	110	70
1300 MATHEMATICAL SCIENCES		
1301 Applied Mathematics	a	a
1302 Computer Science	a	a
1303 Mathematics	a	a
1304 Statistics	a	a

(Continued)

TABLE 8.1 (Continued)

	Unit Area Allocation per Station	
Subject 1	Faculty and Professional (square feet) 2	Student 3
1400 PHYSICAL SCIENCES		
1401 Physical Science, General	--	--
1402 Astrophysics	a	a
1403 Astrogeophysics	a	a
1404 Atmospheric Science	100	60
1405 Chemistry	110	75
1406 Geology	100	60
1407 Physics	110	75
1408 Engineering Physics	110	75
1409 Astronomy	110	75
1500 ENGINEERING SCIENCES		
1501 Aeronautical	120	80
1502 Agricultural	120	80
1503 Architectural	90	60
1504 Chemical	110	70
1505 Civil	100	60
1506 Electrical	100	60
1507 Geological	100	60
1508 Geophysical	100	60
1509 Mechanical	100	60
1510 Metallurgical	110	75
1511 Mining	110	75
1512 Petroleum	110	75
1513 Petroleum Refining	110	75
1514 General, Engineering Science	--	--
1515 Industrial	100	60
1600 SOCIAL SCIENCES		
(A. Non-Laboratory)	a	a
1700 SOCIAL SCIENCES		
(B. Laboratory)		
1701 Anthropology-Archeology	110	70
1702 Geography	100	60
1703 Psychology	110	70
1704 Sociology	a	a
1705 Behavioral Science	a	a
1706 Library Science and Bibliography	a	a

(Continued)

TABLE 8.1 (Continued)

Subject	Unit Area Allocation per Station (square feet)	
	Faculty and Professional	Student
1	2	3
1800 ARTS AND CRAFTS		
1801 Architecture	90	60
1802 Fine Arts	b	b
1803 Commercial Arts	--	--
1804 Industrial Arts and Crafts	--	--
1805 Landscape Architecture	--	--
1806 Music	b	b
1807 Planning	90	60
1808 Engineering Drawing, Graphics, Design	90	60
1900 LANGUAGES AND LITERATURE		
1900 Languages and Literature	a	a
2100 BUSINESS - GENERAL		
2100 Business - General	a	a
2200 EDUCATION		
2200 Education	c	c
2300 HOME ECONOMICS		
2301 General Home Economics	110	70
2302 Family and Child Development	--	--
2303 Clothing and Textiles	110	70
2304 Foods and Nutrition	110	70
2400 LAW		
2400 Law	a	a
2500 JOURNALISM		
2500 Journalism	a	a

(Continued)

TABLE 8.1 (Continued)

Subject 1	Unit Area Allocation per Station Faculty and Professional 2	(square feet)	Student 4
2600 HEALTH PROFESSIONS			
2601 Dentistry	--		--
2602 Medicine	--		--
2603 Nursing	--		--
2604 Pharmacy	110		70
2605 Veterinary Medicine	120		80
2606 Medical Technology	--		--
2607 Occupational, Physical, Speech Therapy	110		70
2608 Pre-Medicine, Pre-Dentistry, Pre-Nursing	--		--

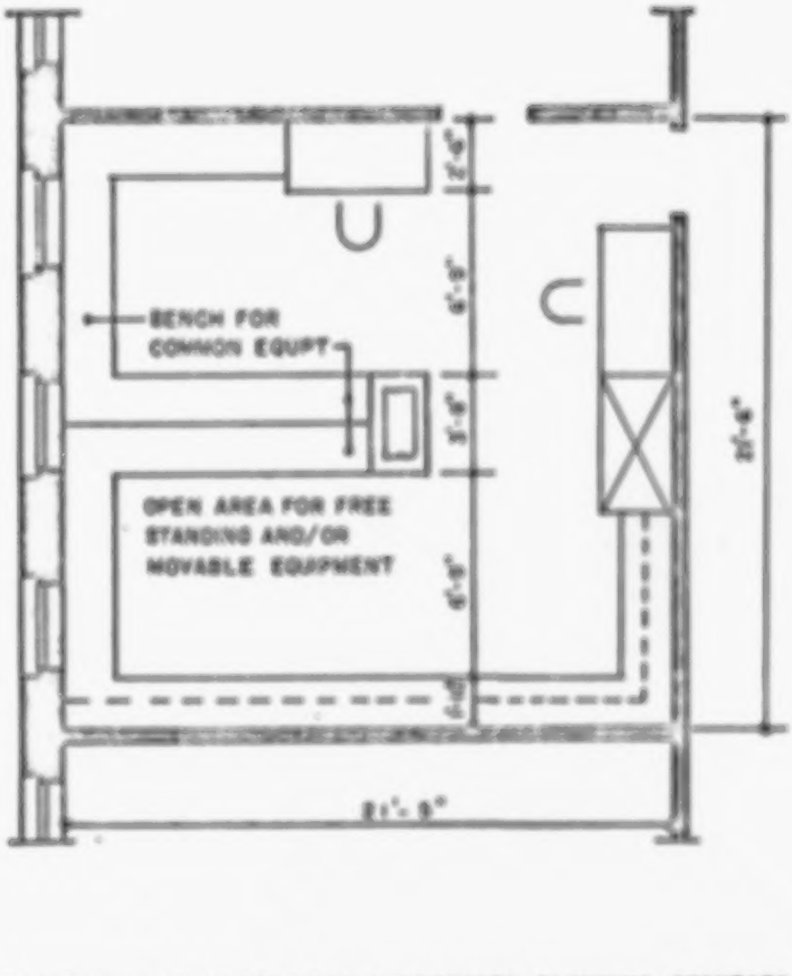
---

[a] No special research space criteria apply. In fact, it is usually the case that only office space is needed.

[b] See studio criteria under teaching laboratories.

[c] Research usually is conducted in the classroom, teaching laboratory, office, or library.

PLATE 8-1, RESEARCH SPACE
TYPICAL PHYSICAL PLANNING CRITERIA


BENCH FOR
COMMON EQUPT
OPEN AREA FOR FREE
STANDING AND/OR
MOVABLE EQUIPMENT
2'-6"
6'-9"
3'-6"
6'-9"
1'-10"
20'-6"
21'-9"

THIS LABORATORY IS BASED UPON A PROPOSED PLANNING STANDARD OF 110 SQ. FT. PER PROFESSIONAL RESEARCHER AND 70 SQ. FT. PER GRADUATE STUDENT. THIS DRAWING SHOWS LABORATORY OF 460 SQ. FT. SUITABLE FOR ONE FACULTY MEMBER, ONE RESEARCH ASSOCIATE AND TWO GRADUATE STUDENTS, DESK SPACE FOR THE TWO STUDENTS IS INCLUDED.

61 LIN.FT OF BENCH SPACE AND HOOD AND SINK ARE PROVIDED,

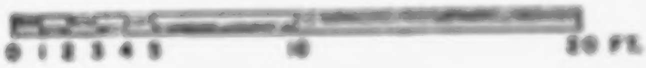

0 1 2 3 4 5 10 20 FT.

TABLE 8.2; RESEARCH SPACE

Recommended Planning Criteria for the Allocation of Space to Service Component of Research Facilities, by Subject

TABLE 8.2 (Continued)

Subject	Service Space as Percent of Primary Research Space		Service Space as Percent of Total Research Space	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
	1100 AGRICULTURAL SCIENCES			
1101 Agronomy	-122-		-55-	
1102 Animal Husbandry	-122-		-55-	
1103 Dairy Husbandry	-122-		-55-	
1104 Dairy Manufacturing	--		--	
1105 Farm Management	--		--	
1106 Horticulture	122	100	55	50
1107 Ornamental Horticulture	122	100	55	50
1108 Poultry Husbandry	-233-		-70-	
1111 Forestry and Range Management	-100-		-50-	
1112 Watershed Management	--		--	
	1200 BIOLOGICAL SCIENCES			
1201 Biological Science	--		--	
1202 Biology, General	-67-		-40-	
1203 Botany	100	67	50	40
1204 Zoology	67	82	40	45
1205 Anatomy and Histology	-67-		-40-	
1206 Bacteriology	-67-		-40-	
1207 Biochemistry	-33-		-25-	
1208 Biophysics	-33-		-25-	
1209 Entomology	-100-		-50-	
1211 Genetics	-67-		-40-	
1212 Pathology	-122-		-55-	
1213 Plant Pathology	-67-		-40-	
1214 Physiology	-67-		-40-	
1215 Microbiology	-67-		-40-	
	1300 MATHEMATICAL SCIENCES			
1301 Applied Mathematics	--		--	
1302 Computer Science	--		--	
1303 Mathematics	--		--	
1304 Statistics	--		--	

(Continued)

TABLE 8.2 (Continued)

Subject 1	Service Space as Percent of Primary Research Space: Large Departments 2	Service Space as Percent of Primary Research Space: Small Departments 3	Service Space as Percent of Total Research Space: Large Departments 4	Service Space as Percent of Total Research Space: Small Departments 5
1400 PHYSICAL SCIENCES				
1401 Physical Science, General	--	--	--	--
1402 Astrophysics	--	--	--	--
1403 Astrogeophysics	--	--	--	--
1404 Atmospheric Science	--		-70-	
1405 Chemistry	33	25	25	20
1406 Geology	25	100	20	50
1407 Physics	67	54	40	35
1408 Engineering Physics	-54-		-35-	
1409 Astronomy	-54-		-35-	
1500 ENGINEERING SCIENCES				
1501 Aeronautical	-33-		-25-	
1502 Agricultural	-33-		-25-	
1503 Architectural	-33-		-25-	
1504 Chemical	-33-		-25-	
1505 Civil	-33-		-25-	
1506 Electrical	-33-		-25-	
1507 Geological	-33-		-25-	
1508 Geophysical	-33-		-25-	
1509 Mechanical	-33-		-25-	
1510 Metallurgical	-33-		-25-	
1511 Mining	-33-		-25-	
1512 Petroleum	-33-		-25-	
1513 Petroleum Refining	-33-		-25-	
1514 General, Engineering Science	--		--	
1515 Industrial	-33-		-25-	
1600 SOCIAL SCIENCES				
(A. Non-Laboratory)	--		--	
1700 SOCIAL SCIENCES				
(B. Laboratory)				
1701 Anthropology-Archeology	-233-		-70-	
1702 Geography	-233-		-70-	
1703 Psychology	25	33	20	25
1704 Sociology	--		--	
1705 Behavioral Science	--		--	
1706 Library Science and Bibliography	--		--	

(Continued)

TABLE 8.2 (Continued)

Subject 1	Service Space as Percent of Primary Research Space Large Departments 2	Service Space as Percent of Primary Research Space Small Departments 3	Service Space as Percent of Total Research Space Large Departments 4	Service Space as Percent of Total Research Space Small Departments 5
1800 ARTS AND CRAFTS				
1801 Architecture	-33-		-25-	
1802 Fine Arts	-33-		--	
1803 Commercial Arts	-33-		--	
1804 Industrial Arts and Crafts	-33-		--	
1805 Landscape Architecture	-33-		--	
1806 Music	-33-		--	
1807 Planning	-33-		-25-	
1808 Engineering Drawing, Graphics, Design	-33-		-25-	
1900 LANGUAGES AND LITERATURE				
1900 Languages and Literature	--		--	
2100 BUSINESS - GENERAL				
2100 Business - General	--		--	
2200 EDUCATION				
2200 Education	--		--	
2300 HOME ECONOMICS				
2301 General Home Economics	-54-		-35-	
2302 Family and Child Development	--	--	--	--
2303 Clothing and Textiles	-54-		-35-	
2304 Foods and Nutrition	-100-		-50-	
2400 LAW				
2400 Law	--		--	
2500 JOURNALISM				
2500 Journalism	--		--	

(Continued)

TABLE 8.2 (Continued)

Subject	Service Space as Percent of Primary Research Space		Service Space as Percent of Total Research Space	
	Large Departments	Small Departments	Large Departments	Small Departments
1	2	3	4	5
2600 HEALTH PROFESSIONS				
2601 Dentistry	--		--	
2602 Medicine	--		--	
2603 Nursing	--		--	
2604 Pharmacy	-100-		-50-	
2605 Veterinary Medicine	-150-		-60-	
2606 Medical Technology	--		--	
2607 Occupational, Physical, Speech Therapy	-122-		-55-	
2608 Pre-Medicine, Pre-Dentistry, Pre-Nursing	-122-		--	

WORKSHEET 8.1; RESEARCH SPACE

Projection of Staff Project Research Space Requirements at Selected Planning Stages, by Primary-Service Space Classification

Institution____________________ Department____________________

	Space Category	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Staff project research space:						
2	Primary space:						
3	Faculty and professional:						
4	Total number of persons						
5	Number requiring research space						
6	Unit area allocation per researcher[b]						
7	Primary space[b]						
8	Student:						
9	Total number of students[a]						
10	Number requiring research space						
11	Unit area allocation per researcher[b]						
12	Primary space[b]						
13	Total primary space[b]						
14	Service space:						
15	Planning ratio: service space/primary space						
16	Service space[b]						
17	Total primary and service space[b]						

(Continued)

WORKSHEET 8.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: No entry
Line 4: Worksheet series 4.6
Line 5: Policy planning assumption
Line 6: Table 8.1
Line 7: Line 5 x line 6
Line 8: No entry
Line 9: Worksheet series 4.6
Line 10: Policy planning assumption
Line 11: Table 8.1
Line 12: Line 10 x line 11
Line 13: Line 7 + line 12
Line 14: No entry
Line 15: Table 8.2
Line 16: Line 15 x line 13
Line 17: Line 13 + line 16

PREPARED:	APPROVED:	SUBMITTED:
By______	By______	By______
Date______	Date______	Date______

TECHNICAL NOTES:

[a] Teaching assistants, research assistants, other graduate students, departmental undergraduate students.

[b] In square feet.

WORKSHEET 8.2; RESEARCH SPACE

Projection of Space Required for Large Scale Specialized Equipment and Technical Services Used in Supporting Research Programs, by Primary-Service Space Classification

Institution ______________ Department ______________

	Space Category and Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Research space: large scale technical services:						
2	Primary space (in square feet):						
3	Item:						
4	Item:						
5	Item:						
6	Item:						
7	Item:						
8	Item:						
9	Item:						
10	Item:						
11	Item:						
12	Item:						
13	Total primary space						
14	Service space:						
15	Planning ratio: service space/primary space						
16	Service space (in square feet)						
17	Total primary and service space (in square feet)						

(Continued)

WORKSHEET 8.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: No entry
Line 4: Worksheet series 4.6
Line 5: Policy planning assumption
Line 6: Table 8.1
Line 7: Line 5 x line 6
Line 8: No entry
Line 9: Worksheet series 4.6
Line 10: Policy planning assumption
Line 11: Table 8.1
Line 12: Line 10 x line 11
Line 13: Line 7 + line 12
Line 14: No entry
Line 15: Table 8.2
Line 16: Line 15 x line 13
Line 17: Line 13 + line 16

PREPARED:
By____________________
Date__________________

APPROVED:
By____________________
Date__________________

SUBMITTED:
By____________________
Date__________________

TECHNICAL NOTES:

[a] Teaching assistants, research assistants, other graduate students, departmental undergraduate students.

[b] In square feet.

WORKSHEET 8.2; RESEARCH SPACE

Projection of Space Required for Large Scale Specialized Equipment and Technical Services Used in Supporting Research Programs, by Primary-Service Space Classification

Institution____________________ Department____________________

		Planning Stage					
	Space Category and Item	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Research space: large scale technical services:						
2	Primary space (in square feet):						
3	Item:____________						
4	Item:____________						
5	Item:____________						
6	Item:____________						
7	Item:____________						
8	Item:____________						
9	Item:____________						
10	Item:____________						
11	Item:____________						
12	Item:____________						
13	Total primary space__						
14	Service space:						
15	Planning ratio: service space/primary space________						
16	Service space (in square feet)						
17	Total primary and service space (in square feet)						

(Continued)

WORKSHEET 8.2 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: Institutional records and policy planning assumption
Line 4: Institutional records and policy planning assumption
Line 5: Institutional records and policy planning assumption
Line 6: Institutional records and policy planning assumption
Line 7: Institutional records and policy planning assumption
Line 8: Institutional records and policy planning assumption
Line 9: Institutional records and policy planning assumption
Line 10: Institutional records and policy planning assumption
Line 11: Institutional records and policy planning assumption
Line 12: Institutional records and policy planning assumption
Line 13: Sum of lines 3-12
Line 14: No entry
Line 15: Table 8.2
Line 16: Line 15 x line 13
Line 17: Line 13 + line 16

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 8.3; RESEARCH SPACE

Summary of Research Space Requirements at Selected Planning Stages, by Space Category

Institution____________________ Department____________________

	Space Category	Planning Stage					
		I	II	III	IV	V	VI
				(square feet)			
	1	2	3	4	5	6	7
1	Staff project research space:						
2	Primary space						
3	Service space						
4	Subtotal						
5	Research space: large scale technical services:						
6	Primary space						
7	Service space						
8	Subtotal						
9	All research space:						
10	Primary space						
11	Service space						
12	Total						

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet series 8.1
Line 3: Worksheet series 8.1
Line 4: Worksheet series 8.1
Line 5: No entry
Line 6: Worksheet series 8.2
Line 7: Worksheet series 8.2
Line 8: Worksheet series 8.2
Line 9: No entry
Line 10: Line 2 + line 6
Line 11: Line 3 + line 7
Line 12: Line 4 + line 8

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 8.4: RESEARCH SPACE

Summary of Research Space Requirements at Selected Planning Stages, by Department

Institution______________________________

		Planning Stage					
		I	II	III	IV	V	VI
				(square feet)			
	Department 1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13	Total						

DATA SOURCES:

All data are from worksheet series 8.3.

PREPARED:
By____________________
Date__________________

APPROVED:
By____________________
Date__________________

SUBMITTED:
By____________________
Date__________________

CHAPTER 9

LIBRARY SPACE

The library is the heart of a college or university. Although the content and nature of the library will vary widely with the nature, size, and character of the institution, the basic units of building space required to house the readers, books and services of the library are sufficiently uniform to permit the use of common planning criteria. The combination of these units, however, will take many different forms according to the needs of the institution. The purpose of this chapter is to provide a method for calculating floor area requirements; the design, functional organization and layout of a library is a matter to be woked out by the experts; i.e., the architects and professional librarians.[1] It is important that the institution's librarian be consulted when determining how existing facilities should be used in the future and the type of additional facilities that will have to be built.

A number of significant technological changes in library services are in the offing and should be kept in mind: e.g., the growing use of microfilm, reproduction equipment, and recordings; the prospects of improved techniques of facsimile transmission; the use of "teaching machines" and closed circuit television; improved design of reader station furniture; development of group study methods; the use of computers in cataloging and circulation services; centralized technical services.

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[1] See, e.g., Ralph E. Ellsworth, Planning the College and University Library Building: A Book for Campus Planners and Architects (Boulder, 1960).

All of these will affect library space requirements. It will be many decades, however, before books are replaced by electronic memory storage systems, and only in rare cases will these developments actually reduce space requirements. The reader must always be served, and books are still the most efficient means of storing and transmitting knowledge.

A. Planning Criteria for Library Facilities

The general unit area criteria for library facilities are shown in table 9.1. These were recommended by the consultants to the Association, with supplementary recommendations for faculty library studies and for open stack book storage (i.e., stacks open to library users in general as against closed stacks which are open only to library staff and limited users) supplied by Dr. Ralph E. Ellsworth, director of libraries of the University of Colorado.

The reader station floor area allowances for different types of stations have been tested by the consultants in actual floor layouts and found to be adequate and flexible. The book storage unit area standards per volume are averages for common types of shelving. The percentage allowances for library service space vary according to the size of the library. No attempt has been made to break down the various types of service space. This is dependent upon the design and type of library. However, provision has been made in the procedure for the specification of the composition of library service space, if desired.

1. Reader Stations

It is recommended that the general standard for determining the number of library reader stations be 25 percent of projected student enrollment plus some proportion of projected faculty and other professional staff. The student allocation basis is somewhat lower than the standard recommended by the Association of College and Research Libraries, which is 30 percent of enrollment. Some institutions are striving to achieve as much as 50 reader stations for every 100 students enrolled. Since few institutions now achieve as much as 20 reader stations per 100 students, and since rapid growth in the next decade will make it difficult to attain and hold even the 25 percent ratio, the recommended proportion is realistic. Subsequent studies of intensity of library usage will determine whether a higher proportion of reader stations is needed. In certain special cases, where the nature of a library unit clearly requires a higher allocation ratio for reader stations due to intensive use, higher proportions of reader stations should be planned. The declining use of textbooks purchased by the students in favor of more extensive reading lists in many courses requires greater use of multiple-copy reserved book facilities which in turn require the student to spend more time reading in the library. More extensive use of library research by students is a clear trend in most institutions.

Given the aggregate reader station capacity estimate, a determination should be made in consultation with the institution's librarian of how the required reader stations will be allocated among the various types. General reading rooms are large open areas with 60 or more reader stations.

Special reading rooms include those with 40 or fewer stations: e.g., periodical and reference rooms; microfilm or listening stations; rooms equipped with table-top dividers. Carrel stations are those equipped with dividers and some book locker equipment; they may either be grouped together in a room or distributed through stacks. The category "other" is included to allow for unique features for reader stations not included above, such as group study rooms, typing rooms, and the like. Institutions also should allow for a limited number of private faculty studies for faculty members doing scholarly work in the library. This is an important provision in the research libraries of the universities. A small number (usually not exceeding 10) should also be allowed in the college libraries. The number allocated is to be determined by the institution and should be fully justified.

2. Book Storage

The growth in the number of library volumes to be housed must be projected for each planning stage (according to a reasonable time scale) in consultation with the institution's librarian. This requires an accurate inventory of existing holdings and determination of the expected annual rate of growth.

Some empirical rules-of-thumb may be helpful in this respect. Nationally, library collections have tended to double in size every sixteen years; science collections have been doubling every decade.[*] Within this general pattern, small institutions usually have higher growth rates, while large institutions have smaller growth rates. A critical factor is the degree of maturity of the library collection. Nevertheless, the general historical trends may be tested on semi-logarithmic graph paper by the individual institution, using historical data describing the growth of the institution's own library, if such data are available, and projecting the number of volumes forward so that they double in sixteen years. The rate of growth may then be measured off the graph and fitted to each planning stage. At the rate of doubling every sixteen years, the book collection will increase by a factor of 1.55 in ten years, 2.00 in sixteen years and 2.35 in twenty years.

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[*] See Council on Library Resources, *Annual Report*, 1959, p. 7; Derek J. Price, "The Exponential Curve of Science", *Discovery*, June, 1956.

The size of book collections normally is measured in terms of numbers of volumes, but some institutions use the more accurate measure of lineal feet of shelved books. Generally, scientific books average 4 or 5 volumes per lineal foot and other fields about 6 volumes per lineal foot. On the average, and in standard stack shelving, 0.6 assignable square foot is required for each lineal foot of shelved books (equivalent to 0.10 assignable square foot per volume). However, the unit area allocation will vary with the type of book storage facility adopted. The distribution of collections by type of storage facility should be determined in consultation with the institution's librarian; that is, the proportion of the collection to be shelved in closed stacks, open stacks, volumes in reading rooms, or other type of storage.

3. Service Facilities

Library service facilities generally fall into two broad categories: reader services, and technical services. These in turn encompass a wide range of types: public catalogues; circulation control and processing; purchasing, cataloguing and processing; microfilm processing; reproduction equipment; record and tape listening facilities; and general storage. The amount of space required for these service elements depends very much upon library organization and type and the physical design of facilities. Therefore, the projection of space needs is carried out by means of a percentage allowance for service of the area required for books and readers. These allowances are given in table 9.1, varying according to the size of the library.

B. Outline of Procedure

As suggested earlier, the first step in the calculation of library space requirements is the projection of reader station capacity needed in library facilities. Worksheet 9.1 may be used for the specification of such capacity requirements at each planning stage. A separate worksheet is to be used for each library unit; that is, the main library and all branch library installations. The worksheet calls for the calculation of reader station capacity as a function of the population groups that will be the principal users of the specific library unit under consideration. Reference should be made to table 9.1 for determination of the planning criteria for the ratio of reader stations to total users, students and staff, for whom library space must be provided. The percentage distribution of capacity requirements by type of station must be decided by the planning analyst, presumably in consultation with the director of library services. The numerical distribution of reader stations will then be a function of the total reader capacity required and the planning assumption regarding the preferred distribution of this capacity among various types of stations.

Worksheet 9.2 should be used for determining the space required to accommodate projected reader station capacity in each library unit, by planning stage. The space requirements are to be projected by type of reader station. Thus, reference must be made to the data developed in worksheet 9.1 regarding the numerical distribution of reader station capacity programmed in library facilities at each planning stage. These workload estimates then should be combined with the recommended physical planning criteria for unit area allocations to various types of reader stations shown in table 9.1; the total program area requirements associated with each type of reader station can be obtained by multiplication. Aggregation of the program area estimates for the various types of reader station facilities will produce total space requirements for library reader stations at each planning stage.

Worksheet 9.3 shifts attention to the requirements for book storage capacity in library facilities. The first portion of the worksheet focuses upon the growth in the size of the collection (number of volumes, rather than titles) in the specified library unit at each planning stage. The worksheet then calls for a delineation of the probable distribution of the collection among various types of book storage facilities; e.g., closed stacks, open stacks, various types of reading rooms, reserve books and other types of storage. Conversion of these data into an estimate of the numerical distribution of the collection by type of storage facility then is a simple arithmetical operation.

Worksheet 9.4 should be used for converting the projection of book storage capacity requirements into the corollary estimate of book storage space requirements. For capacity requirements, the data developed in worksheet 9.3 may be used. The unit area allocation criteria appropriate to each type of book storage facility are suggested in table 9.1. Combining the projection of capacity requirements with the unit area allocation criteria will produce estimates of the total space required in each type of book storage facility. Aggregation of the estimates will yield the total book storage space requirements at each planning stage.

As the next step, the space required for library service facilities and the summary of total library space requirements may be calculated. Table 9.1 suggests that library service space may be calculated as a function of the total allocation of space to reader stations and book storage. Therefore, provision is made in worksheet 9.5 for a) aggregating the program area estimates for reader stations and book storage, and b) applying the planning ratio for service facilities to this aggregate to obtain the allocation to service space. Total library space requirements then may be obtained by adding the estimated allocations of space to reader stations, book storage and service facilities. Worksheet 9.5 when completed provides information regarding total library space requirements and the distribution of these requirements among the three major categories of library facilities at each planning stage.

Worksheet 9.6 can be used for analyzing the service space allocation in greater detail. Service facilities are divisible into two broad categories: reader service space, and technical service space. Within each of these broad categories are further sub-divisions. Reader services may be sub-divided into space for public catalogues, circulation control and so on. Technical services may be sub-divided into processing space, records and reproduction space and other facilities. To calculate the allocation of space to these various components of the service facilities category, a planning assumption regarding the percentage distribution of service space among these various sub-categories must be developed. Application of this relative distribution to the program area estimate for service facilities developed in worksheet 9.5 will yield the estimated distribution of service facilities, in area terms, among the several subcategories delineated. It should be noted that worksheet 9.6 is optional and completion is not critical for the implementation of the broad objectives of the programming study. The worksheet, however, will be found useful if a more detailed analysis of the service space component of library facilities is found necessary at a later date.

Worksheets 9.7 and 9.8 should be used for the development of summary statements of the program area requirements for library facilities. In worksheet 9.7, the focus is upon the aggregate amount of library space required at a specific planning stage, and a separate worksheet must be completed for each planning stage. The worksheet calls for the delineation of the distribution of program area requirements among the three broad library facility categories in each library unit. Aggregating the allocations to each library unit will yield an estimate of the total space required for all library facilities, by broad library space category.

Worksheet 9.8 calls for an enumeration of the total space requirements of each library unit, by planning stage. The data for the summary are drawn from worksheets 9.5 and/or 9.7. Aggregation of the total allocations of space to each library unit will yield the estimated over-all space requirements for library facilities at each planning stage.

TABLE 9.1; LIBRARY SPACE

Recommended Planning Criteria for the Allocation of Space to Selected Components of Library Facilities

	Space Category 1	Planning Criteria Assignable Square Feet 2	Other 3
1	Reader station space:		
2	Reader stations as percent of enrollment	--	25
3	Unit area allocation per reader station:		
4	General reading rooms[a]	18	--
5	Special reading rooms[b]	22	--
6	Carrels	30	--
7	Faculty study stations[c]	48	--
8	Book storage space:		
9	Unit area allocation per volume:	.167	= 15 vols/sf
10	Closed stacks	.080	-- 12.5 vols/sf
11	Open stacks[c]	.091 .100	11 vols/sf -- 10 vols per sf
12	Open shelving in reading rooms	.133	-- 7.5 vols per sf
13	Service space[d]:		
14	As percent of total library space:		
15	Large libraries[e]	--	17
16	Small libraries[f]	--	20
17	As percent of reader and book storage space:		
18	Large libraries[e]	--	20
19	Small libraries[f]	--	25

(Continued)

TABLE 9.1 (Continued)

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[a] For rooms with 60 or more stations.

[b] Periodicals, reference, etc.; for reading rooms with 40 stations or less.

[c] The units for faculty study cubicles and for open stack shelving are recommended by Dr. Ralph E. Ellsworth, Director of Libraries, University of Colorado.

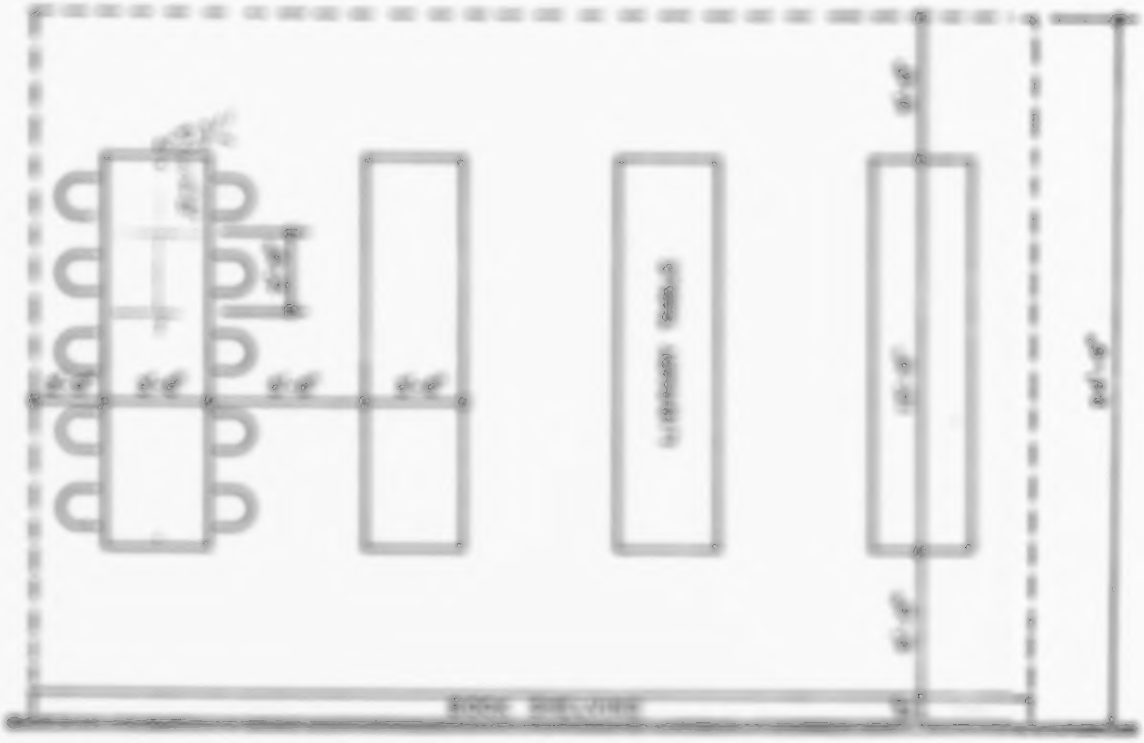
[d] Other space components which might conceivably be included in the library facilities, such as office or classroom space, are not accounted for in these criteria. These elements would be covered at a separate stage of the calculating procedure and be included in the summaries of Chapter 17.

[e] Total library space of 40,000 square feet.

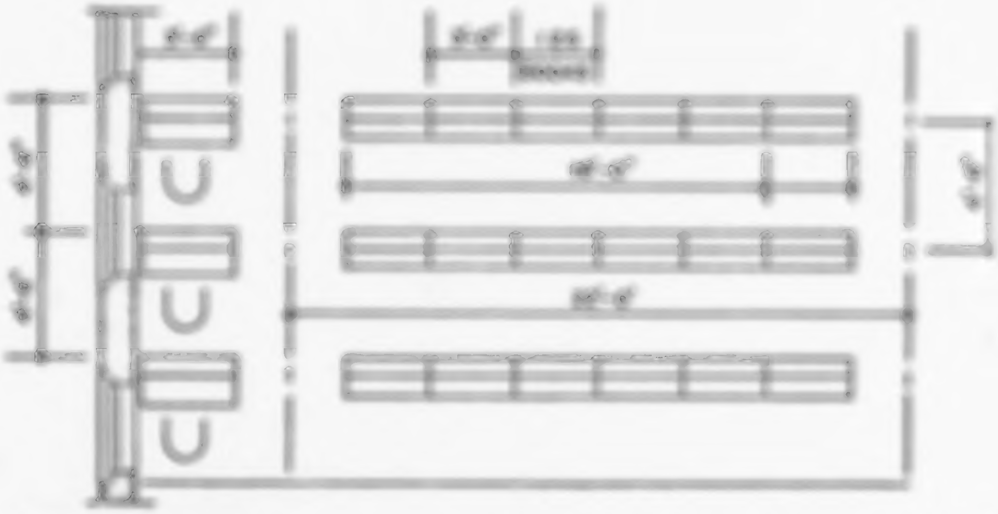
[f] Total library space of less than 40,000 square feet.

$0.110X + 0.133y = .110(x+y)$

PLATE 9-1; LIBRARY SPACE
TYPICAL PHYSICAL PLANNING CRITERIA
READER SPACE AND BOOK STORAGE


LIBRARY TABLE
BOOK SHELVING

READING SPACE: TABLES SEATING 10 REQUIRE 22.5 SQUARE FEET PER PERSON
[illegible] STATIONS = 22.5



CARRELLS: 25 USE 25
SQUARE FEET PER PERSON

FLUSH STACKS: ALLOW 12.5 BOOKS PER SQ.F.

0 1 2 3 4 5 10 20 FT.

WORKSHEET 9.1; LIBRARY SPACE

Projection of Reader Station Capacity Requirements in Library Facilities, by Planning Stage and Type of Station

Institution____________________ Library Unit*____________________

		Planning Stage					
	Item	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Enrollment:						
2	All students						
3	Students using this library unit						
4	Undergraduate students						
5	Graduate students						
6	Faculty and professional staff:						
7	All						
8	Number using this library unit						
9	Planning ratios: reader stations as a percent of all users:						
10	Student stations						
11	General reading rooms: as percent of all student stations						
12	Special reading rooms: as percent of all student stations						
13	Carrels: as percent of all student stations						
14	Other: as percent of all student stations						
15	Faculty and other professional staff stations						

(Continued)

WORKSHEET 9.1 (Continued)

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
16	Number of reader stations:						
17	Student stations______	____	____	____	____	____	____
18	General reading rooms______	____	____	____	____	____	____
19	Special reading rooms______	____	____	____	____	____	____
20	Carrels______	____	____	____	____	____	____
21	Other______	____	____	____	____	____	____
22	Faculty and other professional staff stations______	____	____	____	____	____	____

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 2.1
Line 3: Worksheet 2.2 and policy planning assumption
Line 4: Worksheet 2.2 and policy planning assumption
Line 5: Worksheet 2.2 and policy planning assumption
Line 6: No entry
Line 7: Worksheet 4.6
Line 8: Worksheet 4.6 and policy planning assumption
Line 9: No entry
Line 10: Table 9.1; policy planning criteria
Line 11: Table 9.1; policy planning criteria
Line 12: Table 9.1; policy planning criteria
Line 13: Table 9.1; policy planning criteria
Line 14: Table 9.1; policy planning criteria
Line 15: Table 9.1; policy planning criteria
Line 16: No entry
Line 17: Line 3 x line 10
Line 18: Line 10 x line 11
Line 19: Line 10 x line 12
Line 20: Line 10 x line 13
Line 21: Line 10 x line 14
Line 22: Line 8 x line 15

PREPARED:	APPROVED:	SUBMITTED:
By______	By______	By______
Date______	Date______	Date______

TECHNICAL NOTES:

[a] Worksheet 9.1.1, all units; worksheet 9.1.2, unit 1; worksheet 9.1.n, unit n.

WORKSHEET 9.2; LIBRARY SPACE

Projection of Space Required to Accommodate Reader Station Capacity Requirements in Library Facilities, by Planning Stage and Type of Station

Institution____________________ Library Unit[a]____________________

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Reader stations in general reading rooms:						
2	Number required						
3	Unit area allocation criterion[b]						
4	Program area[b]						
5	Reader stations in special reading rooms:						
6	Number required						
7	Unit area allocation criterion[b]						
8	Program area[b]						
9	Carrels:						
10	Number required						
11	Unit area allocation criterion[b]						
12	Program area[b]						
13	Other reader stations:						
14	Number required						
15	Unit area allocation criterion[b]						
16	Program area[b]						

(Continued)

WORKSHEET 9.2 (Continued)

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
17	Study stations for faculty and other professional staff:						
18	Number required						
19	Unit area allocation criterion[b]						
20	Program area[b]						
21	Summary:						
22	Program area for student reader stations[b]						
23	Program area for faculty study stations[b]						
24	Program area for all reader stations[b]						

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet series 9.1
Line 3: Table 9.1
Line 4: Line 2 x line 3
Line 5: No entry
Line 6: Worksheet series 9.1
Line 7: Table 9.1
Line 8: Line 6 x line 7
Line 9: No entry
Line 10: Worksheet series 9.1
Line 11: Table 9.1
Line 12: Line 10 x line 11
Line 13: No entry
Line 14: Worksheet series 9.1
Line 15: Table 9.1
Line 16: Line 14 x line 15
Line 17: No entry
Line 18: Worksheet series 9.1
Line 19: Table 9.1
Line 20: Line 18 x line 19
Line 21: No entry
Line 22: Line 4 + line 8 + line 12 + line 1
Line 23: Line 20
Line 24: Line 22 + line 23

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Worksheet 9.2.1, all units; worksheet 9.2.2, unit 1; worksheet 9.2.n, unit n.

[b] In square feet.

WORKSHEET 9.3; LIBRARY SPACE

Projection of Book Storage Capacity Requirements in Library Facilities, by Planning Stage and Character of Storage Facility

Institution____________________ Library Unit[a]____________________

		Planning Stage						
	Item	I	II	III	IV	V	VI	Ultimate
	1	2	3	4	5	6	7	8
1	Size of collection:							
2	Annual accession rate[b]							
3	Cumulative growth (number of volumes)							
4	Index of growth: base year = 1.000[c]							
5	Size of collection (number of volumes)							
6	Distribution of collection (percent):							
7	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
8	Closed stacks							
9	Open stacks							
10	Reading rooms:							
11	General reading rooms							
12	Special reading rooms							
13	Other							
14	Reserve							
15	Elsewhere (e.g., dead storage; in circulation, etc.)							
16	Distribution of collection (number):							
17	Total							

(Continued)

WORKSHEET 9.3 (Continued)

	Item	Planning Stage						
		I	II	III	IV	V	VI	Ultimate
	1	2	3	4	5	6	7	8
18	Closed stacks							
19	Open stacks							
20	Reading rooms:							
21	General reading rooms							
22	Special reading rooms							
23	Other							
24	Reserve							
25	Elsewhere							

DATA SOURCES:

Line 1: No entry
Line 2: Institutional records and policy planning assumption
Line 3: Calculated by planning analyst
Line 4: Calculated by planning analyst
Line 5: Line 4: Col. 2 x footnote c; Col. 3 x footnote c;...Col. 8 x footnote c
Line 6: No entry
Line 8: Policy planning assumption
Line 9: Policy planning assumption
Line 10: No entry
Line 11: Policy planning assumption
Line 12: Policy planning assumption
Line 13: Policy planning assumption
Line 14: Policy planning assumption
Line 15: Policy planning assumption
Line 16: No entry
Line 17: Line 5 x line 7
Line 18: Line 5 x line 8
Line 19: Line 5 x line 9
Line 20: Line 5 x line 10
Line 21: Line 5 x line 11
Line 22: Line 5 x line 12
Line 23: Line 5 x line 13
Line 24: Line 5 x line 14
Line 25: Line 5 x line 15

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Worksheet 9.3.1, all units; worksheet 9.3.2, unit 1; worksheet 9.3.n, unit n.

[b] Net. I.e., gross accessions less withdrawals. This may be stated either as a percentage or as an absolute number.

[c] Number of volumes, base year: ________.

WORKSHEET 9.4; LIBRARY SPACE

Projection of Space Required to Accommodate Book Storage Capacity Requirements in Library Facilities, by Planning Stage and Character of Storage Facility

Institution________________________ Library Unit[a]______________________

	Planning Stage						
Item	I	II	III	IV	V	VI	Ultimate
1	2	3	4	5	6	7	8
1 Closed stacks:							
2 Number of volumes							
3 Unit area allocation criterion[a]							
4 Program area[b]							
5 Open stacks:							
6 Number of volumes							
7 Unit area allocation criterion[a]							
8 Program area[b]							
9 General reading rooms:							
10 Number of volumes							
11 Unit area allocation criterion[a]							
12 Program area[b]							
13 Special reading rooms:							
14 Number of volumes							
15 Unit area allocation criterion[a]							
16 Program area[b]							

(Continued)

WORKSHEET 9.4 (Continued)

	Item	Planning Stage						
		I	II	III	IV	V	VI	Ultimate
	1	2	3	4	5	6	7	8
17	Other reading rooms:							
18	Number of volumes							
19	Unit area allocation criterion[a]							
20	Program area[b]							
21	Reserve:							
22	Number of volumes							
23	Unit area allocation criterion[a]							
24	Program area[b]							
25	Elsewhere:							
26	Number of volumes							
27	Unit area allocation criterion[a]							
28	Program area[b]							
29	Summary: all program area[b]							

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet series 9.3
Line 3: Table 9.1
Line 4: Line 2 x line 3
Line 5: No entry
Line 6: Worksheet series 9.3
Line 7: Table 9.1
Line 8: Line 6 x line 7
Line 9: No entry
Line 10: Worksheet series 9.3
Line 11: Table 9.1
Line 12: Line 10 x line 11
Line 13: No entry
Line 14: Worksheet series 9.3
Line 15: Table 9.1
Line 16: Line 14 x line 15
Line 17: No entry
Line 18: Worksheet series 9.3
Line 19: Table 9.1
Line 20: Line 18 x line 19
Line 21: No entry
Line 22: Worksheet series 9.3
Line 23: Table 9.1
Line 24: Line 22 x line 23
Line 25: No entry
Line 26: Worksheet series 9.3
Line 27: Table 9.1
Line 28: Line 26 x line 27
Line 29: Sum of lines 4, 8, 12, 16, 20, 24 and 28

(Continued)

WORKSHEET 9.4 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Worksheet 9.4.1, all units; worksheet 9.4.2, unit 1; worksheet 9.4.n, unit n.

[b] In square feet.

WORKSHEET 9.5; LIBRARY SPACE

Projection of Program Area Requirements for Library Service Facilities and Summary of Total Library Space Requirements, by Planning Stage and Space Category

Institution____________________ Library Unit[a]____________________

		Planning Stage					
	Space Category	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Planning ratio: service facilities as percent of program area allocations to reader stations and book storage						
2	Program area requirements:						
3	Reader station space[b]						
4	Book storage space[b]						
5	Subtotal[b]						
6	Service space[b]						
7	Total[b]						

DATA SOURCES:

Line 1: Table 9.1
Line 2: No entry
Line 3: Worksheet series 9.2
Line 4: Worksheet series 9.4
Line 5: Line 3 + line 4
Line 6: Line 4 x line 1
Line 7: Line 5 + line 6

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] Worksheet 9.5.1, all units; worksheet 9.5.2, unit 1; worksheet 9.5.n, unit n.

[b] In square feet.

WORKSHEET 9.6; LIBRARY SPACE

Distribution of Program Area Requirements for Library Service Facilities, by Type of Space and Planning Stage

Institution____________________ Library Unit[a]____________________

	Space Category	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Service facilities: program area[b]						
2	Distribution of service facilities: percent						
3	Total	100.0	100.0	100.0	100.0	100.0	100.0
4	Reader services						
5	Public catalogues						
6	Circulation control						
7	Other						
8	Technical services						
9	Processing						
10	Records, reproduction						
11	Other						
12	Other						
13	Distribution of service facilities: program area[b]						
14	Total[b]						
15	Reader services[b]						
16	Public catalogues[b]						
17	Circulation control[b]						
18	Other[b]						

(Continued)

WORKSHEET 9.6 (Continued)

		Planning Stage					
	Space Category	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
19	Technical services[b]						
20	Processing[b]						
21	Records, reproduction[b]						
22	Other[b]						
23	Other[b]						

DATA SOURCES:

Line 1: Worksheet series 9.5
Line 2: No entry
Line 3: As indicated
Line 4: Policy planning assumption
Line 5: Policy planning assumption
Line 6: Policy planning assumption
Line 7: Policy planning assumption
Line 8: Policy planning assumption
Line 9: Policy planning assumption
Line 10: Policy planning assumption
Line 11: Policy planning assumption
Line 12: Policy planning assumption
Line 13: No entry
Line 14: Line 1 x line 3 (or worksheet series 9.5)
Line 15: Line 1 x line 4
Line 16: Line 1 x line 5
Line 17: Line 1 x line 6
Line 18: Line 1 x line 7
Line 19: Line 1 x line 8
Line 20: Line 1 x line 9
Line 21: Line 1 x line 10
Line 22: Line 1 x line 11
Line 23: Line 1 x line 12

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Worksheet 9.6.1, all units; worksheet 9.6.2, unit 1; worksheet 9.6.n, unit n.

[b] In square feet.

WORKSHEET 9.7; LIBRARY SPACE

Summary of Program Area Requirements for Library Facilities at Specified Planning Stage, by Library Unit and Space Category

Institution____________________ Planning Stage[a]____________________

	Library Unit	Program Area[b] Reader Stations	 Book Storage	 Service Facilities	 Total
	1	2	3	4	5
1					
2					
3					
4					
5					
6					
7					
8	Total				

DATA SOURCES:

All data are from worksheet series 9.5.

PREPARED:	APPROVED:	SUBMITTED:
By______	By______	By______
Date______	Date______	Date______

TECHNICAL NOTES:

[a] Worksheet 9.7.1, planning stage I, ..., worksheet 9.7.6, planning stage VI.

[b] In square feet.

This worksheet is superfluous if there is only one library unit; i.e., no branch libraries.

WORKSHEET 9.8; LIBRARY SPACE

Summary of Program Area Requirements for Library Facilities, by Library Unit and Planning Stage

Institution____________________________

	Library Unit	Planning Stage					
		I	II	III	IV	V	VI
				(square	feet)		
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13	Total						

DATA SOURCES:

All data are from worksheet series 9.7.

PREPARED:	APPROVED:	SUBMITTED:
By____________________	By____________________	By____________________
Date____________________	Date____________________	Date____________________

CHAPTER 10

MUSEUM AND GALLERY SPACE

Museum and art exhibition facilities do not lend themselves to direct treatment. Floor area requirements will vary widely with the types of institutions, the magnitude of collections, and the nature of the museum or gallery operation.

All institutions need to have collections of mineral, botanical, zoological, and archeological specimens for instruction in the sciences. These are generally part of the supplies and equipment of the teaching laboratories and are not to be included under the museum category.

When significant collections are exhibited by the institution for public as well as student use, they may be considered as museum collections. Similarly, space used for art exhibitions beyond those normally part of the teaching of the fine arts may be classified as museum space.

In smaller institutions, a limited number of exhibit and storage rooms or perhaps the use of a large corridor area may be used for exhibition of special collections of specimens, artifacts and art.

A full-scale museum operation, with full-time curatorial staff and large collections generally will exist only in the universities.

The amount of floor space allocated to museum and gallery facilities must be determined in light of programs at each institution, but table 10.1 suggests some generalized rule-of-thumb measures for programming museum and collection space. Worksheets 10.1 and 10.2 may be used for this purpose.

TABLE 10.1; MUSEUM AND GALLERY SPACE

Recommended Planning Criteria for the Allocation of Space to Museum and Gallery Facilities

	Item	Planning Criteria Assignable Square Feet Number	 Percent
	1	2	3
1	Unit area allocation per FTE student[a,b]	1.80	--
2	Distribution:		
3	Total[b]	1.80	100
4	Display	1.50	83
5	Service	.14	8
6	Storage	.16	9

---

[a] This planning criterion should undoubtedly vary with the size of the student body, the character of the curriculum, and the "mix" of the collections. These variables do not lend themselves to simple planning treatment. The criteria, therefore, should be treated as a point of departure only; suitable modification in the light of particular institutional and departmental circumstances and resources will be required.

[b] Other space components which might be included in over-all museum and gallery facilities, such as office or research space, are not accounted for in this tabulation. Such elements would be accounted for at a separate stage of the calculating procedure and be included in the summaries of Chapter 17.

WORKSHEET 10.1; MUSEUM AND GALLERY SPACE

Space Requirements for Museum and Gallery Facilities, by Type of Space and Planning Stage

Institution____________________ Department____________________

		Planning Stage					
	Item	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Planning criteria:						
2	Unit area allocation criterion: square feet per FTE student						
3	Distribution of program area: percent						
4	Total						
5	Display						
6	Service						
7	Storage						
8	Other						
9	Enrollment: FTE						
10	Distribution of program area: square feet						
11	Total						
12	Display						
13	Service						
14	Storage						
15	Other						

(Continued)

WORKSHEET 10.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Policy planning assumption; table 10.1
Line 3: No entry
Line 4: Policy planning assumption; table 10.1
Line 5: Policy planning assumption; table 10.1
Line 6: Policy planning assumption; table 10.1
Line 7: Policy planning assumption; table 10.1
Line 8: Policy planning assumption; table 10.1
Line 9: Worksheet 2.2 and/or worksheet series 3.8, line 15
Line 10: No entry
Line 11: Line 2 x line 9
Line 12: Line 11 x line 5
Line 13: Line 11 x line 6
Line 14: Line 11 x line 7
Line 15: Line 11 x line 8

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

WORKSHEET 10.2; MUSEUM AND GALLERY SPACE

Summary of Space Requirements for Museum and Gallery Facilities, by Department and Planning Stage

Institution____________________

		Planning Stage					
		I	II	III	IV	V	VI
	Department			(square	feet)		
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13	Total						

DATA SOURCES:

All data from worksheet series 10.1, line 11.

PREPARED:	APPROVED:	SUBMITTED:
By________	By________	By________
Date________	Date________	Date________

CHAPTER 11

ATHLETIC ACTIVITIES SPACE

Indoor facilities for physical education and athletics serve several types of programs important to the "sound body, sound mind" principle: a) required (or elective but organized) physical education activity classes; b) intercollegiate athletics; c) free-time physical activity and intramurals sports; and d) degree program training of physical education instructors for schools and colleges. All of these use gymnasium, swimming pool, fieldhouse and other indoor facilities. Classrooms, specialized teaching laboratories, and faculty offices required for degree program instruction in physical education should be dealt with separately by the methods described in the chapters dealing with those types of space. This chapter deals with floor area requirements for activity areas and supporting service facilities.

A. Activity Levels

Athletic plant comprehends a wide variety of specific facilities. The activities involved may range from swimming to basketball, fencing to general exercise. Moreover, the needs for space are generated by a variety of programs. Required physical education produces a certain combination of workload and facilities requirements. Professional programs, intramural programs, casual needs and intercollegiate programs also generate varying workloads, both in total and by type of activity station. The size and distribution of workload by type of station and generating program also vary with the sex of the participants and the season of the year.

As a point of departure in projecting future space requirements, a tabulation of workloads in the base period, classified by type of activity and generating program, is necessary. Worksheet 11.1 may be used for this analysis. However, this worksheet also should incorporate adjustments that reflect the analyst's estimate of the workloads that would have been experienced at the base year enrollment level where the absence of facilities or special conditions have artificially depressed these workloads. In so doing, the subsequent projection of future activity levels will more accurately reflect the need for athletic plant capacity.

Worksheet 11.2 permits the assembly of needed information for calculating future activity levels. A worksheet should be completed for each planning stage showing the anticipated index of growth in activity expected between the base year and the specified planning stage, classified by type of activity and generating program. For example, the analyst would record the growth factor anticipated in the workload associated with basketball facilities as generated by the required physical education programs; a similar entry would be made to cover the growth generated by the various other programs using this type of athletic facility. A similar index of growth should be entered for each type of activity enumerated and/or expected at the specified planning stage.

The workload projection can be developed by using worksheet 11.3. This may be accomplished by multiplying the base period workload in a particular activity by the index of growth appropriate to that activity program.

B. Capacity and Space Requirements for Athletic Activities

It is now possible to project the capacity and space requirements for each type of facility that might be included in the athletic plant. However, in doing so it must be recognized that there is considerable overlapping in the extent to which various types of activities may be accommodated in a single type of space. For example, basketball and volleyball are two types of activities that use the same type of floor area. But handball and squash usually require a different kind of space than that associated with basketball or volleyball. There also tends to be variation in the intensity of need for various kinds of facilities, depending upon the season of the year considered. Thus, an analysis of capacity requirements for athletic plant should incorporate two adjustments: a grouping of activities that may be considered interchangeable from the point of view of type of facilities required to reduce the number of different special purpose facilities to a minimum; and an identification of the peak period of the year and related workload to be accommodated when such facilities are needed.

Capacity requirements then can be determined by dividing the projected workload for each separate activity station by the planning criterion for the maximum number of persons that may be accommodated at such a station during the interval to which the workload projection applies. Once capacity requirements are known, these may be combined with the recommended physical planning criteria to obtain the desired estimate of program area requirements associated with each kind of activity station.

To be sure, this analysis demands considerable judgement on the part of the planning analyst. He must determine which types of activities may be grouped for purposes of analyzing capacity requirements. He also must select the peak load figure to be used when estimating the maximum workload to be accommodated at any one time. This may require consultation with the persons responsible for implementing the institution's athletic activity programs. But complicated and difficult though the procedure may be, it is preferable to a rule-of-thumb criterion regarding the over-all amount of athletic plant space required per specified number of enrolled students.

C. Spectator Seating

The requirements for spectator seating also can be subjected to systematic study. In worksheet 11.5, such an analysis is outlined. *For each* separate seating installation, the procedure involves the following steps: determining the amount of spectator seating used in the base period; establishing the appropriate index of growth in spectator seating relative to the base period; making a first approximation of spectator seating required, subsequently adjusted on the basis of an evaluation of the reliability of the initial projection; selecting the unit area allocation per spectator seat; calculating the program area requirements by multiplying the projected capacity requirements by the unit area allocation criterion.

D. Auxiliary and Total Space Requirements for Athletic Facilities

The projections thus far have covered only the primary space requirements in indoor athletic facilities. In order to complete the estimates, the primary requirements associated with activity areas and spectator seating must be augmented to cover lockers, shower and toilet facilities and other types of space. Worksheet 11.6 may be used for this purpose.

As is the case elsewhere in the Manual, auxiliary or service space is made a function of the total allocation to primary activity area. Worksheet 11.6 contains a planning assumption regarding the relative size of athletic plant components. This distribution may be used to expand the space requirements already projected for the primary components of athletic plant to obtain total space requirements for all athletic facilities.

Worksheet 11.7 should be used for summarizing the results of the preceding analysis. Aggregate space requirements for athletic activities at each planning stage may be summarized here. Sub-classifications for allocations to men's and women's facilities and activity and auxiliary spaces are provided for in the worksheet.

It should be noted that the nature of the facilities is such that the projected athletic plant could conceivably serve a wide range of enrollments with varying degrees of efficiency in plant utilization. This is partly because of the minimum requirements associated with particular types of activities, and partly because the plant must serve a shifting composition of athletic activities as the seasons change. In this respect, athletic plant is quite similar to special purpose instructional space in the intensity of utilization that can possibly be realized over the course of the year.

TABLE 11.1; ATHLETIC ACTIVITIES SPACE

Recommended Planning Criteria for Selected Components of Indoor Physical Education and Athletic Activities Facilities

	Athletic Activities Station or Component[a] 1	Planning Criteria: Unit Area Allocation Assignable Square Feet 2
1	Basketball courts:	
2	Practice court	4370
3	Competition court	6240
4	Combination of 2 practice courts and 1 competition court	8735
5	Baseball diamond (infield for fieldhouse)	16900
6	Football cage (fieldhouse)	19260
7	Indoor track: 1/4 mile, 6 lanes	33000
8	Handball: 4-wall court	1060
9	Handball: 1-wall court	680
10	Squash: doubles court	1125
11	Squash: singles court	595
12	Shuffleboard	625
13	Volleyball (per court)	3025
14	Wrestling (per mat)	1155
15	Boxing:	
16	Ring (1)	900
17	Punching bag (per bag)	15
18	Punching bag, heavy (per bag)	35
19	Pool (Olympic standards - 6 lanes)	7130
20	Exercise room (per person)	50
21	Rifle range (per point or firing position)	400
22	Pistol range (per point or firing position)	320
23	Fencing (per strip)	325
24	Spectator seating, foldable (per seat)	2.5
25	Lockers (per locker):	
26	Varsity rooms	10
27	General locker room	6.75
28	Tote basket	.50
29	Showers (per head, gang showers)	16
30	Shower-dressing stall for women (per unit)	24
31	Ticket booth	25
32	First aid, training, physical therapy room	750

---

[a] With the exception of self-contained facilities (e.g., handball and squash courts), the criteria all include allowances for buffer zones or circulation space around actual playing or competition area. Clearly, there is room for variation from these figures since a) competition areas need not be regulation-size, and b) two or more units may be combined, with resulting savings in circulation space needs.

TABLE 11.2; ATHLETIC ACTIVITIES SPACE

Recommended Planning Criteria for the Distribution of Indoor Physical Education and Athletic Activities Facilities among Selected Categories of Space

	Space Category 1	Planning Criteria: Percent Distribution of Assignable Space 2	3
1	Athletic activities space		77
2	Playing area	59	
3	Pool	7	
4	Spectator seating	6	
5	Other	5	
6	Auxiliary space		23
7	Lockers	14	
8	Shower and toilet facilities	3	
9	Other	6	
10	Total[a]		100

---

[a] Other space components which might conceivably be included in athletic activities physical plant, such as office or classroom space, are not accounted for in this tabulation. These elements would be accounted for at a separate stage of the calculating procedure and be included in the summaries of Chapter 17.

WORKSHEET 11.1; ATHLETIC ACTIVITIES SPACE

Indoor Space: Summary of Activity Levels in Athletic and Physical Education Programs, by Type of Activity and Season; Base Year, 196_-6_

Institution________________ Department________________ Sex______ Season[a]______________

	Type of Station or Activity 1	Activity Level: Student and/or Staff Periods[b]					
		Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
1	Swimming-diving						
2	Basketball						
3	Gymnastics						
4	Boxing						
5	Wrestling						
6	Volleyball						
7	Fencing						
8	Handball						
9	Squash						
10	General exercise						
11	Track						

(Continued)

WORKSHEET 11.1 (Continued)

		Activity Level: Student and/or Staff Periods[b]					
	Type of Station or Activity 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
12	Baseball						
13	Softball						
14	Football						
15	Soccer						
16	Other						
17	Other						
18	Other						
19	Total						

DATA SOURCES:

All data are from institutional records.

PREPARED:

By__________

Date__________

APPROVED:

By__________

Date__________

SUBMITTED:

By__________

Date__________

TECHNICAL NOTES:

[a] Fall; winter; spring.

[b] The data on activity levels should be adjusted to reflect desired activity levels in instances where absence of facilities has artificially depressed workloads.

WORKSHEET 11.2; ATHLETIC ACTIVITIES SPACE

Indoor Space: Indexes of Growth for Use in Projecting Changes in Activity Levels in Athletic and Physical Education Programs, by Type of Activity

Institution________ Department________ Planning Stage________ Sex________

	Type of Station or Activity	Indexes of Growth in Activity Levels: Base Year to Stage__[a]					
		Base Year: 196_-6_	Required Physical Education	Professional Programs	Intramural Programs	Non-organized (casual)	Intercollegiate
	1	2	3	4	5	6	7
1	Swimming-diving	1.000					
2	Basketball	1.000					
3	Gymnastics	1.000					
4	Boxing	1.000					
5	Wrestling	1.000					
6	Volleyball	1.000					
7	Fencing	1.000					
8	Handball	1.000					
9	Squash	1.000					
10	General exercise	1.000					
11	Track	1.000					

(Continued)

WORKSHEET 11.2 (Continued)

		Indexes of Growth in Activity Levels: Base Year to Stage_[a]					
	Type of Station or Activity 1	Base Year: 196_-6_ 2	Required Physical Education 3	Professional Programs 4	Intramural Programs 5	Non-organized (casual) 6	Intercollegiate 7
12	Baseball	1.000					
13	Softball	1.000					
14	Football	1.000					
15	Soccer	1.000					
16	Other	1.000					
17	Other	1.000					
18	Other	1.000					
19	Total	1.000					

DATA SOURCES:

Col. 1: Worksheet 11.1
Col. 2: Policy planning assumptions
Col. 3: Policy planning assumptions
Col. 4: Policy planning assumptions
Col. 5: Policy planning assumptions
Col. 6: Policy planning assumptions
Col. 7: Policy planning assumptions

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

An explanation should be appended where something other than staff and enrollment expansion has been used as basis for establishing the indexes of growth.

WORKSHEET 11.3; ATHLETIC ACTIVITIES SPACE

Indoor Space: Projection of Activity Levels in Athletic and Physical Education Programs, by Type of Activity

Institution____________ Department____________ Planning Stage__________ Peak Period[a]_______ Sex______

	Activity Level: Student and/or Staff Periods					
Type of Activity or Station 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
1 Swimming-diving						
2 Basketball						
3 Gymnastics						
4 Boxing						
5 Wrestling						
6 Volleyball						
7 Fencing						
8 Handball						
9 Squash						
10 General exercise						
11 Track						

(Continued)

WORKSHEET 11.3 (Continued)

		Activity Level: Student and/or Staff Periods					
	Type of Activity or Station 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
12	Baseball						
13	Softball						
14	Football						
15	Soccer						
16	Other						
17	Other						
18	Other						
19	Total						

DATA SOURCES:

Col. 1: Worksheet 11.1
Col. 2: Worksheet 11.1, Col. 2 x worksheet 11.2, Col. 3
Col. 3: Worksheet 11.1, Col. 3 x worksheet 11.2, Col. 4
Col. 4: Worksheet 11.1, Col. 4 x worksheet 11.2, Col. 5
Col. 5: Worksheet 11.1, Col. 5 x worksheet 11.2, Col. 6
Col. 6: Worksheet 11.1, Col. 6 x worksheet 11.2, Col. 7
Col. 7: Sum of columns 2, 3, 4, 5 and 6

PREPARED:

By____________________
Date__________________

APPROVED:

By____________________
Date__________________

SUBMITTED:

By____________________
Date__________________

TECHNICAL NOTES:

[a] Season.

WORKSHEET 11.4; ATHLETIC ACTIVITIES SPACE

Indoor Space: Projection of Capacity and Space Requirements for Athletic and Physical Education Programs, by Activity Group

Institution______________ Department______________ Planning Stage__________ Peak Period[a]_______ Sex______

Activity Group 1	Activity Level: Student and/or Staff Periods 2	Maximum Number of Persons per Station 3	Capacity Requirements: Number of Stations 4	Unit Area Allocation per Station (square feet) 5	Program Area (square feet) 6
1 Swimming-diving					
2 Gymnasium floor:					
3 Basketball					
4 Volleyball					
5 General exercise					
6 Fencing					
7 Subtotal					
8 Boxing and wrestling					
9 Gymnastics					
10 Handball and squash					

(Continued)

WORKSHEET 11.4 (Continued)

	Activity Group 1	Activity Level: Student and/or Staff Periods 2	Maximum Number of Persons per Station 3	Capacity Requirements: Number of Stations 4	Unit Area Allocation per Station (square feet) 5	Program Area (square feet) 6
11	Fieldhouse activities:					
12	Track					
13	Soccer, football					
14	Baseball					
15	Subtotal					
16	Other					
17	Total					

DATA SOURCES:

Col. 1: Worksheet 11.1
Col. 2: Worksheet 11.3
Col. 3: Policy planning assumption
Col. 4: Col. 2 ÷ Col. 4
Col. 5: Table 11.1
Col. 6: Col. 4 x Col. 5

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Season.

WORKSHEET 11.5; ATHLETIC ACTIVITIES SPACE

Indoor Space: Projection of Capacity and Space Requirements for Spectator Seating, by Type of Activity

Institution____________ Department____________ Planning Stage____________

	Type of Activity	Spectator Seats Used at Public Events: 196_-6_		Index of Growth in Student and Staff Population: 196_-6_ = 1.000	Spectator Seats Required		Unit Area Allocation Criterion (sq. ft.)	Program Area (sq. ft.)
		Average per Event	Percent of Student and Staff Population		First Approximation	Adjusted[a]		
	1	2	3	4	5	6	7	8
1	Swimming and diving							
2	Basketball							
3	Track							
4	Other							
5	Total							

DATA SOURCES:

Col. 1: Policy planning assumption
Col. 2: Institutional records
Col. 3: Col. 2 ÷ total student and staff population
Col. 4: Policy planning assumption

Col. 5: Col. 2 x Col. 4
Col. 6: Col. 5 adjusted by planning analyst in accordance with Technical Note "a"
Col. 7: Table 11.1
Col. 8: Col.6 x Col. 7

(Continued)

WORKSHEET 11.5 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By	By	By
Date	Date	Date

TECHNICAL NOTES:

[a] Explain basis of adjustment.

WORKSHEET 11.6; ATHLETIC ACTIVITIES SPACE

Indoor Space: Space Requirements for Athletic Activities, by Principal Category

Institution________________ Department__________ Planning Stage________ Sex___

	Space Category 1	Percent 2	Program Area (sq. ft.) 3
1	Athletic space:	(77)	
2	Playing area	72	
3	Pool		
4	Spectator seating		
5	Other	5	
6	Auxiliary space:	(23)	
7	Lockers	14	
8	Shower and toilet facilities	3	
9	Other	6	
10	Total	100	

DATA SOURCES[a]:

Col. 1: Table 11.2
Col. 2: Table 11.2
Col. 3, line 2: worksheet series 11.4
Col. 3, line 3: worksheet series 11.4
Col. 3, line 4: worksheet series 11.5
Col. 3, line 10: [Col. 3, sum of lines 2, 3, 4] ÷ (.72)
Col. 3, line 5: Col. 3, line 10 x Col. 2, line 5
Col. 3, line 6: Col. 3, line 10 x Col. 2, line 6
Col. 3, line 7: Col. 3, line 10 x Col. 2, line 7
Col. 3, line 8: Col. 3, line 10 x Col. 2, line 8
Col. 3, line 9: Col. 3, line 10 x Col. 2 line 9
Col. 3, line 1: Sum of lines 2, 3, 4, and 5

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WORKSHEET 11.6 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Order in which Data Sources are presented suggests calculating procedure.

WORKSHEET 11.7; ATHLETIC ACTIVITIES SPACE

Indoor Space: Summary of Space Requirements for Athletic Activities, by Principal Category and Planning Stage

Institution____________________ Department____________________

	Space Category	Planning Stage					
		I	II	III	IV	V	VI
				(square	feet)		
	1	2	3	4	5	6	7
1	Men:						
2	Athletic space						
3	Auxiliary space						
4	Subtotal						
5	Women:						
6	Athletic space						
7	Auxiliary space						
8	Subtotal						
9	Men and women:						
10	Athletic space						
11	Auxiliary space						
12	Total						

DATA SOURCES:

Col. 1-7: All data for lines 1 to 8 are from worksheet series 11.6

Col. 1-7, line 10: line 2 + line 6

Col. 1-7, line 11: line 3 + line 7

Col. 1-7, line 12: line 4 + line 8

PREPARED:
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Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

CHAPTER 12

HOUSING SPACE

Housing facilities are usually revenue-financed and will be excluded from the computations of state-financed capital outlay. However, housing space is a major element in the institutional plant and also generates a need for certain types of facilities that are financed by internal resources or state funds. Therefore, it must be taken account of in the programming procedure.

A. Physical Planning Criteria

The physical planning criteria for the allocation of space to housing facilities are summarized in table 12.1. Actual unit area allocations are specified for a single occupancy living quarter unit, a double occupancy living quarter unit, and one and two bedroom units for married students and faculty staff.

However, living quarters are only a portion of the over-all space required for housing facilities. Especially in housing for single students, substantial allocations must be made for toilets, washrooms and showers, and recreational and service facilities. These components of housing space may typically be treated as a function of the unit area allocation per living quarter unit. The planning criteria listed in table 12.1 treat these components accordingly.

B. Capacity Requirements

The capacity requirements associated with housing facilities must, of course, be established by each institution. Chapter 2 calls for the specification of the institutional planning assumptions with regard to the number of students to be in residence (i.e., in residential facilities) at each planning stage. These estimates should be even further elaborated at this point in the programming study. Each institution should specify the proportion of its single and married students that will be housed. Of course, this will depend upon the proportions of students expected to live at home and commute to the institution, the capacity of the local community to absorb growing numbers of students in private housing, the extent to which fraternities and sororities will absorb a portion of the housing demand, and the philosophy of the institution with regard to on-campus housing.[a] Further, although the capacity of large, old houses convertible to rooming houses generally is limited, private investors have shown increasing interest in providing housing for students in college communities. The policy of the institution towards such developments should be taken into account.

By the same token, it is necessary that institutional policy be defined regarding the provision of housing for married students and staff. The extent to which such housing is to be provided and the distribution of such housing among one-bedroom, two-bedroom and larger units must be established.

---

[a] No provision is made in the Manual for fraternity and sorority housing provided by or leased from the institution. This should be treated as residence hall space. If the institution leases land to such organizations on which they may build their own houses, the land requirement will be dealt with in a later section of the Manual.

C. Outline of Procedure

Worksheets 12.1, 12.2 and 12.3 are devoted to the determination of the requirements for housing capacity by type of occupancy and planning stage. The worksheets call for a specification of the number of living quarter units required in single occupancy, double occupancy and other types of space for male single students and female single students, and the distribution of occupancy by size of apartment unit in the case of married students.

The next three worksheets in the procedure deal with the calculation of the amount of student housing space required. This is accomplished by bringing together the projected capacity requirements in each type of student housing and the unit area physical planning criteria for the type of housing capacity involved. Thus, worksheets 12.4 and 12.5 deal with the housing space required for single male students and single female students, respectively. Worksheet 12.6 focuses upon the housing space requirements for married students. Worksheet 12.7 should be used for determining the capacity and space requirements for housing facilities generated by the institution's staff.

The procedure ends with worksheet 12.8; it provides for a summary of housing space requirements, by type of housing and planning stage.

TABLE 12.1; HOUSING SPACE

Recommended Planning Criteria for the Allocation of Space to Housing Facilities

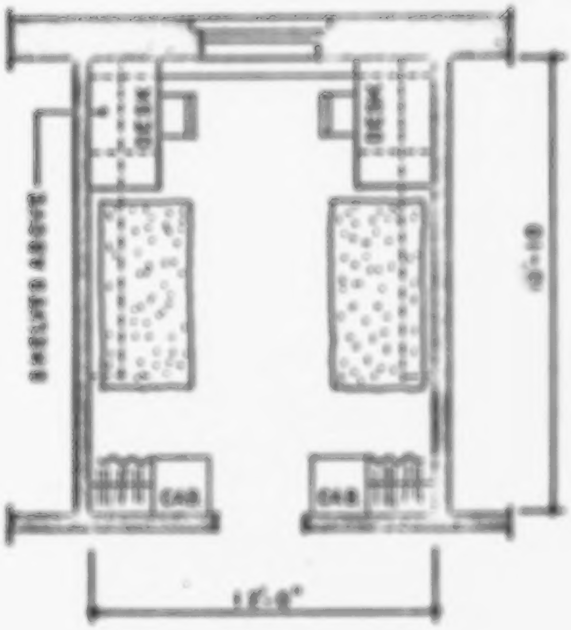
	Item 1	Planning Criteria Assignable Square Feet Number[a] 2	 Percent 3
1	Single students, men and women:		
2	Single occupancy:		
3	Aggregate space requirements per living quarter unit	148	100
4	Living quarters	108	73
5	Toilets, washrooms, showers	12	8
6	Recreational and service[b]	28	19
7	Double occupancy:		
8	Aggregate space requirements per living quarter unit	134 2 / 268	100
9	Living quarters	95 190	71
10	Toilets, washrooms, showers	13.5 2 27	10
11	Recreational and service[b]	25.6 51	19
12	Married students and faculty-staff:		
13	Aggregate space requirements per living quarter unit:		
14	One-bedroom unit	620	100
15	Two-bedroom unit	750	100

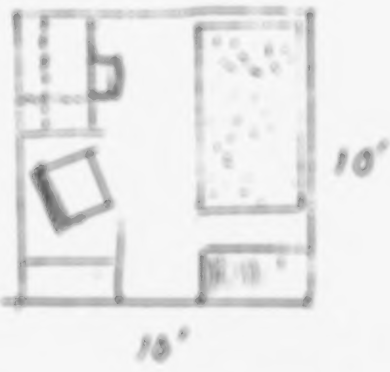
---

[a] In square feet.

[b] Excluding food service facilities.

PLATE 12-1, HOUSING SPACE
PHYSICAL PLANNING CRITERIA FOR DOUBLE OCCUPANCY UNIT


DESK
DESK
SHELVES ABOVE
CAB
CAB
15'-10"
12'-0"



0 1 2 3 4 5 10 20 FT.

WORKSHEET 12.1; HOUSING SPACE

Single Students, Men: Capacity Requirements for Housing Facilities by Type of Occupancy and Planning Stage

Institution____________________ Department____________________

____

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Single students, men:						
2	Number to be housed by institution						
3	Type of occupancy--percent:						
4	Single occupancy						
5	Double occupancy						
6	Other[a]						
7	Type of occupancy--number:						
8	Single occupancy						
9	Double occupancy						
10	Other[a]						
11	Number of living quarter units required:						
12	Single occupancy						
13	Double occupancy						
14	Other[a]						

(Continued)

WORKSHEET 12.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 2.4
Line 3: No entry
Line 4: Policy planning assumption
Line 5: Policy planning assumption
Line 6: Policy planning assumption
Line 7: No entry
Line 8: Line 2 x line 4
Line 9: Line 2 x line 5
Line 10: Line 2 x line 6
Line 11: No entry
Line 12: Line 8 ÷ 1
Line 13: Line 9 ÷ 2
Line 14: Line 10 ÷ number of occupants per unit specified in Technical Note "a"

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] Specify: ____________________

WORKSHEET 12.2; HOUSING SPACE

Single Students, Women: Capacity Requirements for Housing Facilities, by Type of Occupancy and Planning Stage

Institution ______________________ Department ______________________

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Single students, women:						
2	Number to be housed by institution						
3	Type of occupancy--percent:						
4	Single occupancy						
5	Double occupancy						
6	Other[a]						
7	Type of occupancy--number:						
8	Single occupancy						
9	Double occupancy						
10	Other[a]						
11	Number of living quarter units required:						
12	Single occupancy						
13	Double occupancy						
14	Other[a]						

(Continued)

WORKSHEET 12.2 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 2.4
Line 3: No entry
Line 4: Policy planning assumption
Line 5: Policy planning assumption
Line 6: Policy planning assumption
Line 7: No entry
Line 8: Line 2 x line 4
Line 9: Line 2 x line 5
Line 10: Line 2 x line 6
Line 11: No entry
Line 12: Line 8 ÷ 1
Line 13: Line 9 ÷ 2
Line 14: Line 10 ÷ number of occupants per unit specified in Technical Note "a"

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date________________	Date________________	Date________________

TECHNICAL NOTES:

[a] Specify: ____________________

WORKSHEET 12.3; HOUSING SPACE

Married Students: Capacity Requirements for Housing Facilities, by Type of Occupancy and Planning Stage

Institution____________________ Department______________________

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Married students: number to be housed by institution:						
2	Male						
3	Female						
4	Total, gross						
5	Total, net[a]						
6	Type of occupancy--percent:						
7	One-bedroom units						
8	Two-bedroom units						
9	Other units[b]						
10	Type of occupancy--number:						
11	One-bedroom units						
12	Two-bedroom units						
13	Other units[b]						

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 2.4
Line 3: Worksheet 2.4
Line 4: Line 2 + line 3
Line 5: Line 4 corrected by planning analyst in accordance with Technical Note "a"
Line 6: No entry
Line 7: Policy planning assumption
Line 8: Policy planning assumption
Line 9: Policy planning assumption
Line 10: No entry
Line 11: Line 5 x line 7
Line 12: Line 5 x line 8
Line 13: Line 5 x line 9

(Continued)

WORKSHEET 12.3 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By____________________	By____________________	By____________
Date____________________	Date____________________	Date____________

TECHNICAL NOTES:

[a] Adjusted to avoid double-counting in cases where husband and wife are both attending institution and are tabulated separately in lines 2 and 3.

[b] Specify: ________________________

WORKSHEET 12.4; HOUSING SPACE

Single Students, Men: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage

Institution______________________ Department________________________

____

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Single students, men:						
2	Single occupancy living quarter units:						
3	Number required						
4	Unit area allocation criterion[a]						
5	Program area[a]						
6	Double occupancy living quarter units:						
7	Number required						
8	Unit area allocation criterion[a]						
9	Program area[a]						
10	Other living quarter units:						
11	Number required						
12	Unit area allocation criterion[a]						
13	Program area[a]						
14	Total program area[a]						

(Continued)

WORKSHEET 12.4 (Continued)

DATA SOURCES:

Line 1:	No entry	Line 8:	Table 12.1, line 8
Line 2:	No entry	Line 9:	Line 7 x line 8
Line 3:	Worksheet 12.1, line 3	Line 10:	No entry
Line 4:	Table 12.1	Line 11:	Worksheet 12.1
Line 5:	Line 3 x line 4	Line 12:	Planning analyst
Line 6:	No entry	Line 13:	Line 11 x line 12
Line 7:	Worksheet 12.1	Line 14:	Line 5 + line 9 + line 13

PREPARED:	APPROVED:	SUBMITTED:
By______	By______	By______
Date______	Date______	Date______

TECHNICAL NOTES:

[a] In square feet.

WORKSHEET 12.5; HOUSING SPACE

Single Students, Women: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage

Institution________________ Department________________

____

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Single students, women:						
2	Single occupancy living quarter units:						
3	Number required						
4	Unit area allocation criterion[a]						
5	Program area[a]						
6	Double occupancy living quarter units:						
7	Number required						
8	Unit area allocation criterion[a]						
9	Program area[a]						
10	Other living quarter units:						
11	Number required						
12	Unit area allocation criterion[a]						
13	Program area[a]						
14	Total program area[a]						

(Continued)

WORKSHEET 12.5 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: Worksheet 12.2
Line 4: Table 12.1, line 3
Line 5: Line 3 x line 4
Line 6: No entry
Line 7: Worksheet 12.2
Line 8: Table 12.1, line 8
Line 9: Line 7 x line 8
Line 10: No entry
Line 11: Worksheet 12.2
Line 12: Planning analyst
Line 13: Line 11 x line 12
Line 14: Line 5 + line 9 + line 13

PREPARED:
By______________________
Date____________________

APPROVED:
By______________________
Date____________________

SUBMITTED:
By______________________
Date____________________

TECHNICAL NOTES:

[a] In square feet.

WORKSHEET 12.6; HOUSING SPACE

Married Students: Space Requirements for Housing Facilities, by Type of Housing and Planning Stage

Institution____________________ Department____________________

		Planning Stage					
	Item	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Married students:						
2	One-bedroom units:						
3	Number required						
4	Unit area allocation criterion[a]						
5	Program area[a]						
6	Two-bedroom units:						
7	Number required						
8	Unit area allocation criterion[a]						
9	Program area[a]						
10	Other units:						
11	Number required						
12	Unit area allocation criterion[a]						
13	Program area[a]						
14	Total program area[a]						

(Continued)

WORKSHEET 12.6 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: Worksheet 12.3
Line 4: Table 12.1, line 14
Line 5: Line 3 x line 4
Line 6: No entry
Line 7: Worksheet 12.3
Line 8: Table 12.1, line 15
Line 9: Line 7 x line 8
Line 10: No entry
Line 11: Worksheet 12.3
Line 12: Planning analyst
Line 13: Line 11 x line 12
Line 14: Line 5 + line 9 + line 13

PREPARED:	APPROVED:	SUBMITTED:
By____________	By____________	By____________
Date____________	Date____________	Date____________

TECHNICAL NOTES:

[a] In square feet.

WORKSHEET 12.7; HOUSING SPACE

Staff: Capacity and Space Requirements for Housing Facilities, by Type of Housing and Planning Stage

Institution____________________ Department____________________

	Item	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Staff: number to be housed by institution						
2	One-bedroom units:						
3	Number required						
4	Unit area allocation criterion[a]						
5	Program area[a]						
6	Two-bedroom units:						
7	Number required						
8	Unit area allocation criterion[a]						
9	Program area[a]						
10	Other units[b]:						
11	Number required						
12	Unit area allocation criterion[a]						
13	Program area[a]						
14	Total program area[a]						

(Continued)

WORKSHEET 12.7 (Continued)

DATA SOURCES:

Line 1: Policy planning assumption
Line 2: No entry
Line 3: Policy planning assumption
Line 4: Table 12.1, line 14
Line 5: Line 3 x line 4
Line 6: No entry
Line 7: Policy planning assumption
Line 8: Table 12.1, line 15
Line 9: Line 7 x line 8
Line 10: No entry
Line 11: Policy planning assumption
Line 12: Planning analyst
Line 13: Line 11 x line 12
Line 14: Line 5 + line 9 + line 13

PREPARED:
By__________________
Date__________________

APPROVED:
By__________________
Date__________________

SUBMITTED:
By__________________
Date__________________

TECHNICAL NOTES:

[a] In square feet.

[b] Specify:______________________

WORKSHEET 12.8; HOUSING SPACE

Summary of Space Requirements for Housing Facilities, by Housing Group and Planning Stage

Institution__________ Department__________

	Housing Group	Planning Stage I	II	III (square feet)	IV	V	VI
	1	2	3	4	5	6	7
1	Single students, men						
2	Single students, women						
3	Married students						
4	Staff						
5	Total program area						

DATA SOURCES:

Line 1: Worksheet 12.4
Line 2: Worksheet 12.5
Line 3: Worksheet 12.6
Line 4: Worksheet 12.7
Line 5: Sum of lines 1. 2. 3 and 4

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

CHAPTER 13

FOOD SERVICE SPACE

Food service facilities, like housing space, are usually revenue-financed. However, the requirements for food service space may be substantial and the need for such facilities should not be overlooked in programming the over-all physical plant requirements of an institution.

A. Planning Criteria

Several types of planning criteria must be considered when projecting the space required for food service operations. First, it should be noted that three types of food service facilities may be required, covering the following types of dining arrangements: family style, cafeteria and snack bar. The planning criteria for the allocation of space to various components of the food service operation will vary with the character of the dining arrangement considered. Moreover, different criteria must be applied regarding the intensity with which dining stations may be expected to be used during food service intervals. That is, the turnover factor, expressed in terms of number of sittings per station per meal service, will vary with the kind of food service operation. And, finally, the utilization rate, or the proportion of total dining stations occupied at a single sitting, also will vary with the type of food service operation.

Table 13.1 details the recommended planning criteria associated with the several food service arrangements. The turnover factor, utilization rate and physical planning criteria appropriate for use in programming each type of installation are indicated.

B. Capacity Requirements

Naturally, the aggregate requirements for food service space will be a function of the amount of capacity required in dining facilities. Worksheet 13.1 should be used for delineating the anticipated food service workload and distribution by type of dining arrangement. The worksheet takes cognizance of the fact that dining facilities may be located in residence halls, the student center and other facilities such as faculty clubs, special dining rooms and so on. The worksheet also permits analysis of the workload to be accommodated in these various types of facilities, as generated by the combination of student and staff populations on campus at each planning stage. The distribution of the peak food service load by type of dining arrangement also can be specified. Worksheet 13.1, when completed, will show the peak number of persons to be accommodated under family style, cafeteria and snack bar arrangements in residence hall, student center and other locations at each planning stage.

Worksheet 13.2 carries the analysis to the determination of the number of dining stations required in food service facilities, by type of arrangement (family style, cafeteria and snack bar) and type of facility (residence hall, student center and other units). The projection of capacity requirements will reflect the preceding analysis of the total number of persons to be served at the peak period, adjusted to reflect consideration of the turnover factor and utilization rate appropriate to each type of dining arrangement.

C. Space Requirements

Once capacity requirements have been determined, worksheet 13.3 may be used for estimating the space required to accommodate the projected food service capacity needs. Consistent with the preceding analyses, the worksheet is organized to reflect the type of dining arrangement and type of facility involved. The projected number of dining stations required at each planning stage should be combined with the unit area allocation criteria recommended in table 13.1 to obtain the program area estimates for each dining category at each planning stage.

Worksheet 13.4 calls for the development of a summary statement of the program area requirements for food service facilities at each planning stage. The aggregate requirements, taken from worksheet 13.3, are summarized by type of facility and dining category to facilitate comparison and evaluation.

TABLE 13.1; FOOD SERVICE SPACE

Recommended Planning Criteria for the Allocation of Space to Food Service Facilities

		Planning Criteria		
		Assignable Square Feet		
	Item 1	Number 2	Percent 3	Other 4
1	Family style:			
2	Number of sittings at peak interval[a]	--	--	2
3	Utilization rate[b]	--	--	90
4	Aggregate food service space requirements per dining station	28.0	100	--
5	Dining area	12.5	45	--
6	Preparation, serving, cleanup	8.5	30	--
7	Storage and miscellaneous	7.0	25	--
8	Cafeteria:			
9	Number of sittings at peak interval[a]	--	--	4
10	Utilization rate[b]	--	--	80
11	Aggregate food service space requirements per dining station	24.5	100	--
12	Dining Area	11.0	45	--
13	Preparation, serving, cleanup	7.5	31	--
14	Storage and miscellaneous	6.0	24	--
15	Snack bar:			
16	Number of sittings at peak interval[a]	--	--	6
17	Utilization rate[b]	--	--	80

(Continued)

TABLE 13.1 (Continued)

	Item 1	Planning Criteria Assignable Square Feet Number 2	Planning Criteria Assignable Square Feet Percent 3	Other 4
18	Aggregate food service space requirements per dining station	20.5	100	--
19	Dining area	10.0	49	--
20	Preparation, serving, cleanup	5.5	27	--
21	Storage and miscellaneous	5.0	24	--

---

[a] Turnover factor

[b] Proportion of dining stations occupied at any one time during peak interval.

WORKSHEET 13.1; FOOD SERVICE SPACE

Distribution of Food Service Workload at Peak Dining Interval, by Dining Arrangement Category and Type of Facility

Institution_______________ Department_____________ Planning Stage________

		Type of Facility			
	Food Service Workload and Dining Category 1	Residence Halls 2	Student Center 3	Other[a] 4	All 5
1	Number of persons to be served at peak load:				
2	Students				
3	Staff				
4	Total				
5	Distribution of peak load by type of dining arrangement: percent[b]				
6	Family style				
7	Cafeteria				
8	Snack bar				
9	Distribution of peak load by type of dining arrangement: number				
10	Family style				
11	Cafeteria				
12	Snack bar				

DATA SOURCES:

Line 1: No entry
Line 2: Policy planning assumption and partly Worksheet 2.4
Line 3: Policy planning assumption and partly worksheets 4.6 and 4.7
Line 4: Line 2 + line 3
Line 5: No entry
Line 6: Policy planning assumption
Line 7: Policy planning assumption
Line 8: Policy planning assumption
Line 9: No entry
Line 10: Line 4 x line 6
Line 11: Line 4 x line 7
Line 12: Line 4 x line 8

(Continued)

WORKSHEET 13.1 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date________________	Date________________	Date________________

TECHNICAL NOTES:

[a] Specify: ________________________

[b] Sum of lines 6, 7 and 8 should equal 100 percent. I.e., the percentage distribution is within columns, rather than across.

WORKSHEET 13.2: FOOD SERVICE SPACE

Capacity Requirements in Food Service Facilities at Peak Dining Interval, by Dining Arrangement Category and Type of Facility

Institution__________ Department__________ Planning Stage__________

____

		Type of Facility			
	Dining Category	Residence Halls	Student Center	Other[a]	All
	1	2	3	4	5
1	Family style:				
2	Number to be served at peak load				
3	Number of sittings at peak interval				
4	Number of dining stations required:				
5	Unadjusted				
6	Utilization rate				
7	Adjusted				
8	Cafeteria:				
9	Number to be served at peak load				
10	Number of sittings at peak interval				
11	Number of dining stations required:				
12	Unadjusted				
13	Utilization rate				
14	Adjusted				
15	Snack bar:				
16	Number to be served at peak load				
17	Number of sittings at peak interval				

(Continued)

WORKSHEET 13.2 (Continued)

	Dining Category 1	Type of Facility Residence Halls 2	 Student Center 3	 Other[a] 4	 All 5
18	Number of dining stations required:				
19	Unadjusted				
20	Utilization rate				
21	Adjusted				

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 13.1, line 10
Line 3: Table 13.1 (or policy planning assumption)
Line 4: No entry
Line 5: Line 2 ÷ line 3
Line 6: Table 13.1
Line 7: Line 5 ÷ line 6
Line 8: No entry
Line 9: Worksheet 13.1, line 11
Line 10: Table 13.1 (or policy planning assumption)
Line 11: No entry
Line 12: Line 9 ÷ line 10
Line 13: Table 13.1
Line 14: Line 12 ÷ line 13
Line 15: No entry
Line 16: Worksheet 13.1, line 12
Line 17: Table 13.1 (or policy planning assumption)
Line 18: No entry
Line 19: Line 16 ÷ line 17
Line 20: Table 13.1
Line 21: Line 19 ÷ line 20

PREPARED:	APPROVED:	SUBMITTED:
By________	By________	By________
Date________	Date________	Date________

TECHNICAL NOTES:

[a] Specify: ________________

WORKSHEET 13.3: FOOD SERVICE SPACE

Space Requirements for Food Service Facilities, by Dining Arrangement Category and Type of Facility

Institution____________________ Department__________ Planning Stage________

	Dining Category	Type of Facility			
		Residence Halls	Student Center	Other[a]	All
	1	2	3	4	5
1	Family style:				
2	Number of dining stations required				
3	Aggregate unit area allocation criterion[b]				
4	Program area[b]				
5	Cafeteria:				
6	Number of dining stations required				
7	Aggregate unit area allocation criterion[b]				
8	Program area[b]				
9	Snack bar:				
10	Number of dining stations required				
11	Aggregate unit area allocation criterion[b]				
12	Program area[b]				
13	Total program area[b]				

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 13.2, line 7
Line 3: Table 13.1
Line 4: Line 2 x line 3
Line 5: No entry
Line 6: Worksheet 13.2, line 14
Line 7: Table 13.1
Line 8: Line 6 x line 7
Line 9: No entry
Line 10: Worksheet 13.2, line 21
Line 11: Table 13.1
Line 12: Line 10 x line 11
Line 13: Sum of lines 4, 8, 12

(Continued)

WORKSHEET 12.3 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By____________________	By____________________	By____________________
Date____________________	Date____________________	Date____________________

TECHNICAL NOTES:

[a] Specify: ______________________________

[b] In square feet.

WORKSHEET 13.4; FOOD SERVICE SPACE

Summary of Space Requirements for Food Service Facilities, by Type of Facility, Dining Arrangement Category and Planning Stage

Institution____________________ Department____________________

____

	Type of Facility and Dining Category	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
				(square feet)			
1	Residence halls:						
2	Family style						
3	Cafeteria						
4	Snack bar						
5	Subtotal						
6	Student center:						
7	Family style						
8	Cafeteria						
9	Snack bar						
10	Subtotal						
11	Other[a]						
12	Family style						
13	Cafeteria						
14	Snack bar						
15	Subtotal						
16	All facilities:						
17	Family style						
18	Cafeteria						
19	Snack bar						
20	Total						

(Continued)

WORKSHEET 13.4 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet series 13.3, line 4, column 2
Line 3: Worksheet series 13.3, line 8, column 2
Line 4: Worksheet series 13.3, line 12, column 2
Line 5: Worksheet series 13.3, line 13, column 2
Line 6: No entry
Line 7: Worksheet series 13.3, line 4, column 3
Line 8: Worksheet series 13.3, line 8, column 3
Line 9: Worksheet series 13.3, line 12, column 3
Line 10: Worksheet series 13.3, line 13, column 3
Line 11: No entry
Line 12: Worksheet series 13.3, line 4, column 4
Line 13: Worksheet series 13.3, line 8, column 4
Line 14: Worksheet series 13.3, line 12, column 4
Line 15: Worksheet series 13.3, line 13, column 4
Line 16: No entry
Line 17: Worksheet series 13.3, line 4, column 5
Line 18: Worksheet series 13.3, line 8, column 5
Line 19: Worksheet series 13.3, line 12, column 5
Line 20: Worksheet series 13.3, line 13, column 5

PREPARED:	APPROVED:	SUBMITTED:
By____________	By____________	By____________
Date____________	Date____________	Date____________

TECHNICAL NOTES:

[a] Specify: ____________________

CHAPTER 14

STAFF AND STUDENT SERVICE SPACE

Staff and student service facilities vary widely in character and composition. Some of the facilities comprehended by this component of physical plant may be revenue-financed, as in the case of student center facilities, although a substantial portion will be housed in academic and general facilities, such as office-classroom buildings, administration buildings and so on. The projection of staff and student service space requirements should reflect an analysis of the service facilities required for staff and those required for students. Institutional policy will dictate the character of the facilities associated with each of the population groups to be serviced.

Table 14.1 recommends some physical planning criteria for the overall allocation of service space per person in the staff and student population groups. The table suggests that a unit area allocation of four square feet per staff member is appropriate for programming staff service facilities. Presumably, these facilities would be distributed among various buildings on campus; however, the distributional pattern will vary somewhat depending upon whether a faculty club or central staff facility is to be provided.

Similarly, student service facilities tend to be of two types: those located in a centralized facility such as a student center, and those dispersed among other buildings on campus. For student center facilities, the recommended allocation is 8.25 square feet per full-time equivalent student. This is exclusive of any facilities associated with food service operations or other components of space dealt with elsewhere in the Manual. For facilities located outside the student center, an allocation of 1.5 square feet per full-time equivalent student is recommended.

These general criteria will be adequate to the determination of total service space requirements for the programming study. However, table 14.1 contains unit area allocation criteria for selected student service components, and the planning analyst may elect to use these criteria and program such facilities in detail. In any event, at the time such facilities are being programmed for actual construction, the more detailed approach should be used.

Worksheet 14.1 may be used for the projection of staff and student service space requirements at the several planning stages used in the programming study. The worksheet reflects the desirability of developing the space requirement estimates in two broad categories: staff service facilities, and student service facilities. Within each of these categories, further analyses are suggested. For staff service facilities, it is recommended that the service space needs for faculty and professional staff and supporting clerical and technical staff be dealt with separately. Similarly, analysis of the requirements for student service facilities should be conducted in terms of the two allocation patterns; that is, those located in a central facility such as the student center, and those to be located outside such a facility and distributed among the various buildings on campus. The total program area associated with staff and student service space may be obtained by simple aggregation.

At a later stage, when occupancy patterns are being established for existing and proposed buildings (see Chapter 19), the aggregates developed in worksheet 14.1 may be used as control totals governing the total staff and student service space distributed among the complex of buildings required at each planning stage.

TABLE 11.1; STAFF AND STUDENT SERVICE SPACE

Recommended Planning Criteria for the Allocation of Space to Staff and Student Services Facilities

Item 1	Planning Criteria, Assignable Square Feet 2
Staff service facilities:	
Unit area allocation per staff member[a]	4
Student service facilities[b]:	
Unit area allocation per enrolled student:	
Facilities located in student center	8.25
Facilities located outside student center	1.50
All facilities	9.75
Selected student service components:	
Lockers: per locker (full size, floor standing)	6.75
Lounges, common rooms; per station	20
Post office: per mailbox (including auxiliary service facilities such as counters, etc.)	.75
Meeting room: per station	20
Barber shop: per chair	100
Billiards: per table	320
Bowling alley: per lane	375
Kitchenette	20
Table tennis: per table	345

---

[a] This covers all lounge and common room facilities for faculty and other professional staff and supporting technical and clerical personnel. Kitchenette facilities are included, but regular food service facilities, such as cafeterias, are not.

[b] The planning criterion of 9.75 square feet per student would apply only in the absence of student center facilities. Should student center facilities be provided separately, the service areas outside the student center could be scaled down to about 1.5 square feet per student. The planning criterion for the allocation of space per student in student center facilities may vary widely since it is largely dependent upon the character and extent of the individual space or activity components that are included. Planning criteria for selected student center elements are listed in the table.

WORKSHEET 14.1; STAFF AND STUDENT SERVICE SPACE

Space Requirements for Staff and Student Service Facilities,
by Facility and Population Category and Planning Stage

Institution________________________ Department______________________

	Facility and Population Category	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Staff service facilities:						
2	Faculty and professional staff:						
3	Number of persons						
4	Unit area allocation criterion[a]						
5	Program area[a]						
6	Supporting clerical and technical staff:						
7	Number of persons						
8	Unit area allocation criterion[a]						
9	Program area[a]						
10	Student service facilities:						
11	Located in student center:						
12	Number of students						
13	Unit area allocation criterion[a]						
14	Program area[a]						
15	Located outside student center:						
16	Number of students						
17	Unit area allocation criterion[a]						
18	Program area[a]						
19	Total program area, staff and student service facilities[a]						

(Continued)

WORKSHEET 14.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: No entry
Line 3: Worksheet series 4.6
Line 4: Table 14.1
Line 5: Line 3 x line 4
Line 6: No entry
Line 7: Worksheet series 4.6
Line 8: Table 14.1
Line 9: Line 7 x line 8
Line 10: No entry
Line 11: No entry
Line 12: Worksheet 2.2
Line 13: Table 14.1
Line 14: Line 12 x line 13
Line 15: No entry
Line 16: Worksheet 2.2
Line 17: Table 14.1
Line 18: Line 16 x line 17
Line 19: Sum of lines 5, 9, 14, 18

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] In square feet.

CHAPTER 15

MISCELLANEOUS OTHER SPACE

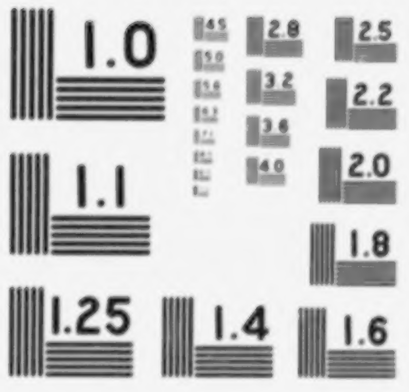
This chapter provides for the determination of miscellaneous building space requirements not accounted for in previous sections, except for physical plant maintenance and operation facilities to be determined in Chapter 16. Under the heading of miscellaneous building space would come special facilities for auxiliary enterprises (e.g., printing plant), infirmaries, armory, non-institutional agencies housed on the campus (e.g., installations of federal agencies), public facilities such as a large auditorium or concert hall, and any other type of facility which cannot be accounted for under any of the eleven broad categories of building space considered elsewhere in the Manual.

Such facilities may even be fully owned by an outside agency, but should be listed if the institution provides land or plant maintenance and operation services to the facility. Worksheet 15.1 provides for the listing of such facilities and the determination of the amount of space required for them at each planning stage.

6 OF 7

ED

015628


1.0
4.5
5.0
5.6
6.3
7.1
8.0
9.0
10
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963

WORKSHEET 15.1; MISCELLANEOUS OTHER SPACE

Space Requirements for Miscellaneous Other Facilities Not Covered Elsewhere[a]

Institution____________________ Department____________________

	Type of Facility[b]	Planning Stage					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
				(square feet)			
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11	Total program area						

DATA SOURCES:

All data are to be developed by the planning analyst.

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

TECHNICAL NOTES:

[a] I.e., not covered in Chapters 5-14 and Chapter 16.

[b] Append statement describing function of facility and basis for program area estimate.

CHAPTER 16

PHYSICAL PLANT MAINTENANCE AND OPERATIONS FACILITIES

Building area for the shops, storage, and other facilities required for the maintenance and operation of physical plant, buildings and grounds, and service components of the institution may best be estimated by a general analysis of the requirements of such operations in consultation with the business manager and physical plant superintendent. As a rule, these components are not strongly related to institutional size, but constitute certain minimum fixed requirements. As the total floor area of the institutional plant (including housing) passes certain magnitudes, additional floor area for buildings and grounds service operations may be required.

As a general guideline, table 16.1 lists some empirically established planning criteria for physical plant service building space. These criteria, which are expressed as a function of assignable square feet of all other building area to be maintained and serviced, cannot be applied until the total floor area requirements of all other facilities are compiled. Worksheet 16.1 will permit the development of summaries of the space requirements projected for all other facilities. Worksheet 16.2 may then be used to project the space required for physical plant maintenance and operation facilities.

It should be noted that the space identified by this general category does not include the wide variety of building service elements that are dispersed among campus buildings other than those associated with central maintenance operations. Thus, janitor rooms, mechanical equipment rooms, elevator facilities, and similar facilities located in individual buildings and serviced by central physical plant maintenance are not included as assignable square feet; the space associated with this building elements is considered to be part of the gross area of campus buildings, but not part of the net area. (See discussion in Chapter 18.)

TABLE 16.1; PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE

Recommended Planning Criteria for the Allocation of Space to Physical Plant Maintenance and Operations Facilities[a]

	Space Component 1	Planning Criteria: Unit Area Allocation per Thousand Square Feet of Assignable Space to be Serviced Assignable Square Feet 2
1	Maintenance shops	11.0
2	Heating plant	8.6
3	Garages	8.4
4	General storage	12.5
5	Miscellaneous other	2.7
6	Total[b]	43.2

---

[a] Since institutional plant varies in size and location, these figures are not universally applicable. For example, heating plant very likely declines relative to total plant as the total size of the plant increases. Conversely, maintenance shops probably increase in relative importance and begin to perform projects that were formerly subcontracted. Once again, these figures should be used as a point of departure and only in this initial phase of gross approximation of future physical plant requirements.

[b] Other space components which might be included in physical plant maintenance facilities, such as office space, are not accounted for in this tabulation. Such elements would be accounted for at a separate stage of the calculating procedure and be included in the summaries of Chapter 17.

WORKSHEET 16.1; PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE

Summary of Assignable Physical Plant Space to Be Serviced and
Maintained, by Major Space Category and Planning Stage

Institution____________________ Department All

	Space Category 1	Planning Stage I 2	 II 3	 III (square feet) 4	 IV 5	 V 6	 VI 7
1	Major space category						
2	Classroom						
3	Special purpose instructional						
4	Office						
5	Research						
6	Library						
7	Museum and gallery						
8	Athletic activities						
9	Housing						
10	Food service						
11	Staff and student service						
12	Miscellaneous and other						
13	Total program area of assignable space to be serviced						

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 5.4
Line 3: Worksheet 6.4
Line 4: Worksheet 7.4
Line 5: Worksheet 8.4
Line 6: Worksheet 9.8
Line 7: Worksheet 10.2
Line 8: Worksheet 11.7
Line 9: Worksheet 12.8
Line 10: Worksheet 13.4
Line 11: Worksheet 14.1
Line 12: Worksheet 15.1
Line 13: Sum of lines 2 through 12

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 16.2; PHYSICAL PLANT MAINTENANCE AND OPERATIONS SPACE

Space Requirements for Physical Plant Maintenance and Operations Facilities, by Service Building Space Component and Planning Stage

Institution________________________ Department________________________

____

		Planning Stage					
		I	II	III	IV	V	VI
				(square feet)			
	Space Component						
	1	2	3	4	5	6	7
1	Thousands of square feet of assignable space to be serviced						
2	Service building space:						
3	Unit area allocation criteria[a]:						
4	Maintenance shops						
5	Heating plant						
6	Garages						
7	General storage						
8	Miscellaneous other						
9	Total						
10	Program area:						
11	Maintenance shops						
12	Heating plant						
13	Garages						
14	General storage						
15	Miscellaneous other						
16	Total						

(Continued)

WORKSHEET 16.2 (Continued)

DATA SOURCES:

Line 1: Worksheet 16.1, line 13 ÷ 1000
Line 2: No entry
Line 3: No entry
Line 4: Table 16.1
Line 5: Table 16.1
Line 6: Table 16.1
Line 7: Table 16.1
Line 8: Table 16.1
Line 9: Table 16.1
Line 10: No entry
Line 11: Line 1 x line 4
Line 12: Line 1 x line 5
Line 13: Line 1 x line 6
Line 14: Line 1 x line 7
Line 15: Line 1 x line 8
Line 16: Line 1 x line 9

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Square feet of service building space per thousand square feet of assignable space to be serviced.

CHAPTER 17

AGGREGATE SPACE REQUIREMENTS

At this stage of the programming effort, all space required for all components of physical plant located on campus have been projected. It is now possible to review the results of the programming effort and develop various summary tabulations of projected space requirements. Since the analysis has been conducted along functional lines, this is the first opportunity available to review the over-all physical plant requirements in departmental terms.

Typically, there are several kinds of information required in the summary of space requirements. For example, it is desirable to know how much space is required by each department at each planning stage, by type of space. It is useful to examine the pattern in which the departmental space requirements increase across the several planning stages considered in the programming study, by type of space. It also is useful to compare departments in terms of the growth in total space requirements across the planning interval, by planning stage. Naturally, total institutional requirements, classified by department, type of space and planning stage, can be developed by simple aggregation.

Worksheet 17.1 calls for an analysis of the distribution of physical plant requirements in each department at a specified planning stage, by type of space. A separate worksheet must be completed for each planning stage used in the programming study.

Worksheet 17.2 focuses upon the individual department and its pattern of development. The aggregate space required by each department, by type of space and planning stage, is compiled from an analysis of the results of the programming effort as recorded in the worksheets of Chapters 5 through 16. A separate worksheet must be completed for each department.

Finally, worksheet 17.3 is designed for the enumeration of all departments and the recording of the aggregate space requirements of each department at each planning stage used in the programming study. The worksheet also can be used for aggregating total institutional space requirements at each planning stage, thereby permitting comparison between changes in total institutional space requirements and changes in the space requirements of each department.

WORKSHEET 17.1; AGGREGATE SPACE REQUIREMENTS

Distribution of Physical Plant Program Area Requirements at Specified Planning Stage, by Department and Space Category

Institution____________________ Planning Stage____________________

		Space Category[a]						
	Department 1	Classroom 2	Special Purpose Instructional 3	Office 4	Research (sq.ft.) 5	Library 6	Museum and Gallery 7	Athletic Activities 8
1								
2								
3								
4								
5								
6								
.								
.								
.								
n	Total							

DATA SOURCES:

Col. 1: Planning analyst
Col. 2: Worksheet series 5.4
Col. 3: Worksheet series 6.5
Col. 4: Worksheet series 7.4
Col. 5: Worksheet series 8.4
Col. 6: Worksheet series 9.8
Col. 7: Worksheet series 10.2
Col. 8: Worksheet series 11.7
Col. 9: Worksheet series 12.8
Col. 10: Worksheet series 13.4
Col. 11: Worksheet series 14.1
Col. 12: Worksheet series 15.1
Col. 13: Worksheet series 16.2
Col. 14: Sum of columns 2 to 13

(Continued)

WORKSHEET 17.1 (Continued)

	Space Category[a]					
	Housing 9	Food Service 10	Staff and Student Service 11	Miscellaneous and Other 12	Physical Plant Maintenance and Operations 13	Total 14
1						
2						
3						
4						
5						
6						
.						
.						
.						
n						

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

TECHNICAL NOTES:

[a] All figures are in square feet.

WORKSHEET 17.2; AGGREGATE SPACE REQUIREMENTS

Summary of Physical Plant Program Area Requirements at Selected Planning Stages, by Principal Space Category

Institution____________________ Department____________________

	Space Category	Planning Stage: Program Area Requirements (square feet)					
		I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	Classroom						
2	Special purpose instructional						
3	Office						
4	Research						
5	Library						
6	Museum and gallery						
7	Athletic activities						
8	Housing						
9	Food service						
10	Staff and student service						
11	Miscellaneous other						
12	Physical plant maintenance and operations						
13	Total						

DATA SOURCES:

All data are from worksheet series 17.1.

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

WORKSHEET 17.3; AGGREGATE SPACE REQUIREMENTS

Summary of Total Physical Plant Program Area Requirements at Selected Planning Stages, by Department

Institution____________________________

		Planning Stage: Program Area Requirements					
		I	II	III	IV	V	VI
	Department			(square feet)			
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7							
.							
.							
.							
n	Total						

DATA SOURCES:

All data are from worksheet series 17.1

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

PART IV

PHYSICAL PLANT CONSTRUCTION, DEMOLITION AND REMODELING PROGRAM

PART IV

PHYSICAL PLANT CONSTRUCTION, DEMOLITION AND REMODELING PROGRAMS

The Manual thus far has been devoted to the development and exposition of a statistical model for the projection of college and university space requirements under a specified constellation of workload estimates and institutional policies. The model recognizes twelve broad categories of physical plant facilities and is explicit with regard to projecting the amount of each type of space required to meet the future needs of individual divisions and operating departments. At this stage, with requirements stated and the quasi-theoretical aspects of the model completed, we must turn to the next stage of analysis: determining a) how the institution can best use existing buildings, including demolition and remodeling where this is appropriate, and b) what new structures are required, if any. In short, it is now possible to turn to the elaboration of the building program.

A necessary ingredient in developing a building program is a knowledge of the size and characteristics of the existing physical plant. Such information is of little value or may be unavailable where new institutions are being organized or existing institutions are being relocated to an entirely new campus. But for institutions that will continue to operate on the same campus and use all or a portion of their existing physical plant, a physical plant inventory is extremely important. Consequently, Chapter 18 is devoted to questions involving the physical plant inventory and how it may be accomplished.

With a background of information concerning the present physical plant, comparison then can be made with the estimates of future space requirements to determine the over-all deficit (or surplus) that may confront an institution at each planning stage. After analyzing the existing buildings to determine which ones are amenable to reuse and evaluating the relative urgency of the departmental needs for various kinds of space, building occupancy programs covering the existing buildings and new construction can be developed for the several planning stages under consideration. Such building occupancy programs are specific with respect to the departmental units occupying a building and the total amount of each kind of space to be assigned to these departments. Finally, with the present and the proposed configurations of building occupancy and departmental space allocations delineated, the analyst can proceed to the development of a schedule for phasing from the present to the proposed pattern. This schedule will enumerate and indicate the order or priority of the various demolition, construction and remodeling projects required to implement the physical plant modification program. This aspect of the programming procedure is covered in Chapter 19. When completed, the physical plant portion of the campus development programming procedure will have been implemented.

CHAPTER 18

PHYSICAL PLANT INVENTORY

A. General Remarks

In programming the future development of an institution, a thorough knowledge of existing physical plant resources is necessary. Thus, at some point during the programming study, an inventory of existing physical plant should be undertaken. The inventory should focus upon providing information regarding the following characteristics of the physical plant: a) the amount of space available; b) what kind of space is available (the distribution of total available space by use); c) the location of available space (the distribution of total available space by building and type); and d) who uses the space (the distribution of total available space by department and type of space). This statistical cross-sectional view of the use and disposition of space in the available physical plant will provide the desired point of departure for determining net additional physical plant requirements in the future.

Of course, it should be borne in mind at all times that the statistical record describes the physical plant pattern at a point in time: the interval during which the field survey of existing physical facilities is conducted. Subsequent changes in the amount or assignment of physical plant are excluded from the data. The survey also usually involves the preparation or updating of record drawings of the floor layouts of existing buildings. The use of facilities usually must be established after consultation with representatives of the departments controlling the space so that the statistical record will reflect an informed interpretation of the functional and administrative assignments of all components of the physical plant.

B. Space Classification System

Before considering the classification system to be used in the collection of data on space utilization, three broad definitional concepts should be mentioned. The first, gross area, is an aggregate figure which encompasses all floor space delimited by the perimeter walls of a building, including attics and basements, but excluding attic or crawl space with less than six feet of standing room. A second category, occupied area, refers to the floor space of a building, exclusive of the thickness of both interior and exterior walls, duct areas, and all major circulation facilities such as stairwells, corridors, elevator shafts and the like. The third category, net area or assignable square footage, refers to occupied area less all space assigned to building maintenance, such as janitor rooms, mechanical equipment and apparatus rooms needed for the functioning of a building, public restrooms and toilet facilities (except in residential facilities and athletic plant, where toilet facilities are an integral part of the net usable space requirements).

The aggregate referred to as net area encompasses the twelve major categories of space already alluded to elsewhere in the Manual. Included are the following: classroom space; special purpose instructional space; office space; research space; library space; museum and gallery space; athletic activities space; housing space; food service space; staff and student service space; miscellaneous other space; physical plant operation and maintenance space; and unused or unassigned space. The detailed subcategories of space encompassed by the broad classification system have already been referred to in Chapters 5 through 16 and will not be repeated here. Mention should be made, however, of the alternate systems that are presented in Appendix D for use in numerical coding of the physical plant inventory. The coding systems are designed to permit the inventory to be processed on mechanical or electronic data processing equipment, should this prove feasible.

C. Outline of Procedure

Worksheet 18.1 is the basic building data sheet to be used in the inventory of existing physical plant. A separate worksheet is required for each building and each worksheet summarizes the various characteristics of space utilization relevant to the inventory. The worksheet permits the recording of the occupancy pattern within each building as of the date of the inventory; that is, the amount of space allocated to specific departmental units, by type of space used. Worksheet 18.1A is the basic room inventory worksheet from which the summary data in worksheet 18.1 are to be developed.

Worksheet 18.2 is a summary of the physical plant inventory. This worksheet calls for an enumeration of all buildings in the existing physical plant complex, with an indication of four items of information: the gross area of the building; the net area or assignable square footage in the building; and the ratios of gross area to net area and net area to gross area for each building.

The preceding two worksheets focus upon the actual pattern of space allocation on the date of the inventory. But to implement the programming study, there must be a shift in perspective to future utilization of existing physical plant. That is, future building occupancy patterns require that existing buildings be adapted to changes in administrative assignments or space utilization patterns. However, existing buildings are not likely to be 100 percent efficient in absorbing space programs that are based upon the procedures and physical planning criteria recommended elsewhere in this Manual. This is because both the physical and policy planning criteria that underlie the space programs are not likely to be consistent with the architectural configurations of buildings designed for another age. Therefore, it is desirable that the existing physical plant be evaluated with regard to the efficiency with which it can absorb proposed space assignments.

Worksheet 18.3 is to be used for this purpose. It calls for an evaluation of each existing building in order to determine how effectively it can absorb space programs which have been based upon the physical planning criteria and policy assumptions underlying the programming study. For example, some buildings may be 95 percent effective in absorbing recommended programs; others may be only 80 percent efficient. The net available space in each building after allowing for these considerations should be indicated in worksheet 18.3.

Worksheet 18.4 allows for the exploration of another point of view with regard to the size and distribution of available space in the existing physical plant. Instead of using the individual building as a point of departure, worksheet 18.4 calls for an analysis of the current allocation of net available space to each department, classified by type of space and building location. A separate worksheet is to be completed for each department. The data thus developed provide a basis for evaluating departmental dispersion as well as the amounts of various kinds of space available to individual operating units.

Summary tabulations of the total amount of space available in the existing physical plant can be developed from the several worksheets described above. The distribution of available space by type of space, department and building are readily accomplished through simple aggregation procedures.

WORKSHEET 18.1A; PHYSICAL PLANT INVENTORY

Data Tabulation Sheet: Room Inventory

Institution____________________

	Item	Entry	Field	Code
	1	2	3	4
1	Building		(3) 1 - 3	
2	Floor number		(1) 4	
3	Room number		(4) 5 - 8	
4	Data sheet number		(1) 9	
5	Net floor area, total		(4) 10 - 13	
6	Department		(3) 14 - 16	
7	Assigned floor area: percent of total		(3) 17 - 19	
8	Assigned floor area: net area		(4) 20 - 23	
9	Present room use		(4) 24 - 27	
10	Stations: number installed		(4) 28 - 31	
11	Stations: optimum number		(4) 32 - 33	

Dimensions for Area Calculations (Item 5)	Notes

INVENTORY:

By____________________

Date____________________

CODING:

By____________________

Date____________________

WORKSHEET 18.1; PHYSICAL PLANT INVENTORY

Building ________; Tabulation of the Current Allocation of Net Available Area, by Space Category (Function) and Occupant (Department)

Institution________________ Building____________ Date Constructed (or to be completed)______

Date of Inventory______________ Type of Structure____________ General Function______________

	Building Occupancy Pattern: Square Feet of Space Allocated to Specified Departments						
Space Category	Dept. 1	Dept. 2	Dept. 3	Dept. 4	Dept. 5	Dept. 6	All Depts.
1	2	3	4	5	6	7	8
1 Classroom							
2 Special purpose instructional							
3 Office							
4 Research							
5 Library							
6 Museum and gallery							
7 Athletic activities							
8 Housing							
9 Food service							
10 Staff and student service							
11 Miscellaneous other							

(Continued)

WORKSHEET 18.1 (Continued)

Space Category	Building Occupancy Pattern: Square Feet of Space Allocated to Specified Departments						
	Dept. 1	Dept. 2	Dept. 3	Dept. 4	Dept. 5	Dept. 6	All Depts.
1	2	3	4	5	6	7	8
12 Physical plant maintenance and operations							
13 Unassigned							
14 Total assignable square feet							

DATA SOURCES:

All data are from institutional records and/or a physical plant survey.

PREPARED:	APPROVED:	SUBMITTED:
By	By	By
Date	Date	Date

TECHNICAL NOTES:

1 A separate worksheet should be completed for each building.

2 Indicate any anticipated changes that may affect future use of building; e.g., renovation, demolition.

3 Worksheet 18.1A should be used as the basic data tabulation sheet for the room inventory. The data in worksheet 18.1 can then be developed by aggregation from the detailed room inventory sheets.

4 Specify names of individual departments covered in column headings.

WORKSHEET 18.2; PHYSICAL PLANT INVENTORY

Summary Tabulation of Gross and Net Areas of Existing Buildings, by Building

Institution____________________ Date of Inventory____________________

____

		Space Category			
	Building 1	Gross Area (square 2	Net Area feet) 3	Ratio: Gross Area/Net Area 4	Ratio: Net Area/Gross Area 5
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	Total				

(Continued)

WORKSHEET 18.2 (Continued)

DATA SOURCES:

Col. 1: Institutional records
Col. 2: Institutional records and/or a physical plant survey
Col. 3: Institutional records and/or a physical plant survey
Col. 4: Col. 2 ÷ Col. 3
Col. 5: Col. 3 ÷ Col. 2

PREPARED:	APPROVED:	SUBMITTED:
By______________	By______________	By______________
Date______________	Date______________	Date______________

WORKSHEET 18.3; PHYSICAL PLANT INVENTORY

Adjustment of Inventory Tabulation of Net Available Space to Reflect Capacity of Existing Buildings to Absorb Projected Space Programs

Institution__________________ Date of Inventory______________

____

		Net Available Space		
	Building 1	Unadjusted[a] (square feet) 2	Absorption Coefficient[b] (percent) 3	Adjusted (square feet) 4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

(Continued)

WORKSHEET 18.3 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 18.1
Col. 2: Worksheet series 18.1
Col. 3: Policy planning assumption
Col. 4: Col. 2 x Col. 3

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] As inventoried.

[b] Figure should reflect the planning analyst's judgment of the efficiency of the building in absorbing space programs that are based upon the physical planning criteria underlying the preceding programming system.

WORKSHEET 18.4; PHYSICAL PLANT INVENTORY

Department _________; Analysis of the Current Allocation of Net Available Area, by Space Category (Function) and Building

Institution_______________________ Date of Inventory__________________

		Building				
		B.1	B.2	B.3	B.4	Total
	Space Category	(square feet)				
	1	2	3	4	5	6
1	Classroom					
2	Special purpose instructional					
3	Office					
4	Research					
5	Library					
6	Museum and gallery					
7	Athletic activities					
8	Housing					
9	Food service					
10	Staff and student service					
11	Miscellaneous other					
12	Physical plant maintenance and operations					
13	Total assignable square feet					

DATA SOURCES:

All data are from institutional records and/or a physical plant survey.

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date______________	Date______________	Date______________

TECHNICAL NOTES:

1. A separate worksheet should be completed for each department.

CHAPTER 19

BUILDING PROGRAM

By this stage of the programming study, it will be possible to develop a program for the use of existing buildings and the construction of new facilities over the planning interval under consideration. The amount and characteristics of space requirements at several planning stages have been projected. Similarly, the amount and characteristics of space available in existing physical plant have been established. These two sets of information can now be evaluated so that the physical plant phase of the campus development program can be articulated.

A. Size of Building Program

Worksheet 19.1 provides a basis for developing a first approximation of the over-all deficit (or surplus) of space in existing physical plant relative to the space needed at some specified future planning stage. The aggregate space available in existing facilities (as adjusted for absorptive efficiency in accordance with worksheet 18.3)is subtracted from the aggregate space required at planning stage X. An estimate is thus obtained of the approximate total amount of new construction required during the interval that will elapse between the base year and the specified planning stage.

This estimate must be described as an approximation because of the inflexibilities and fixed nature of physical plant facilities. For example, the deficit may be small but not of sufficient size to warrant construction of only a small facility to make up the deficit. A larger building than is necessary to make up the deficit may perhaps have to be built in anticipation of further growth beyond the target planning stage and ultimate improvement in the effectiveness with which the new structure will be used. Alternately, there may be a surplus of one kind of physical plant and a shortage of another; but the former may not be adaptable to remodeling to compensate for the shortages in the latter. By way of illustration, suppose there are too many pools in the athletic plant; this is likely to be of little use in making up for any space shortages that may be present in the heating plant or in the kitchen facilities associated with residential dining halls.

However, the calculation does provide the basis for a rough estimate of the order of magnitude of the shortage (or surplus) that may characterize the existing physical plant relative to future needs. The actual amounts of construction that may be required can only be determined after completing the analysis outlined in the remaining worksheets of this chapter.

B. Priority of Need

A more ticklish and difficult aspect of the building program is that of determining the relative urgency of the need to eliminate deficiencies in net area at the department or department group level. Preceding sections of the programming study will have made possible a comparison of future space requirements and net area available in existing physical plant on a departmental basis. This comparison permits the determination of whether or not there will be a deficit in available space at a specified planning stage as well as the order of magnitude of the deficit.

Clearly, the planning analyst must make some judgement as to the relative urgency of the need to offset any projected physical plant deficiencies that may confront the many departments of an institution.

One measure of priority that may be developed can be based on the actual size of the deficit in usable space. That is, departments may be ranked by the absolute size of their expected space deficits, the largest deficit defining the highest priority of need, the smallest deficit defining the lowest. Another measure that might be developed would involve the calculation of the size of the deficit in each department relative to its base period allocation of space. Once again, the order of the ranking would be determined by the size of the relative deficit in each department. The department having the largest deficit relative to the base period allocation would be ranked first in order of priority; the department having the smallest relative deficit would be ranked last in the priority system.

Clearly, neither of these measures will prove faultless. A deficit of 1,000 square feet for a small department may be just as significant to it and the institution as a deficit of 10,000 square feet in a large department. Similarly, a ten percent deficiency in a large department may be as significant as a 50 percent deficiency in a small department. A ranking of priority based either on the absolute size or relative size of the space deficit is not satisfactory in and of itself.

Some combination of these two priority measures is desirable. One possibility is suggested in the technical notes to worksheet 19.2, which is devoted to the analysis of priority ranking in the building program.

This would involve ranking departments in terms of the order of magnitude of the product obtained when the figures designating the department ranks based upon both absolute size and relative size of deficit are multiplied by each other. However, even this system may not prove satisfactory. For example, in some instances a particular department must be accorded high priority status because of the pivotal nature of the department or its present building location in the over-all development program, even though the department may actually have relatively less need for additional space either in absolute terms or in relative terms than other departments. That is, the strategic position or location of the department may be the primary consideration. Quality of existing facilities also must be taken into account. For these reasons, the ultimate decisions on priority of need must be made by the planning analyst in light of a detailed knowledge of the institution for which the programming study has been undertaken. The opportunity for the analyst to record such evaluations is provided in worksheet 19.2.

C. Building Occupancy Patterns

Against this background of information regarding the departmental space deficits and the priority to be accorded individual departments in eliminating deficiencies, the analyst can turn to developing the desired building occupancy pattern at the planning stages under consideration. Worksheets 19.3, 19.4 and 19.5 can be used for this purpose.

In worksheet 19.3, the building approach is taken. Each building in the existing physical plant complex is studied and a departmental occupancy pattern is determined for each planning stage. The departments and the amounts of each type of space required by them are enumerated. Several attempts may be necessary until an approximately good fit is obtained between the space available in a building and the space required by the departments programmed into the building. After programming the use of existing buildings, new buildings may be considered.

In the case of both existing and new buildings, the process of arriving at a satisfactory occupancy pattern may require several efforts. Although this may appear to be a hit or miss proposition, in actual fact the analyst will be able to eliminate many possibilities immediately because of his experience and informed basis for dealing with the development problems at his institution. A separate worksheet must be developed for each existing building that will be retained in the future and for each new building or addition that will be needed to meet the over-all physical plant required at the specified planning stage.

Worksheet 19.4 focuses upon individual departments. It may be used for determining the ideal location pattern of the program area requirements associated with the department under analysis. A separate worksheet should be completed for each department and the conclusions should be consistent with those already generated in completing worksheet 19.3.

Worksheet 19.5 is optional; it is a master worksheet covering the building occupancy and department location patterns for all buildings and departments at a specified planning stage. However, it is useful. The cross-classification of departments and buildings will provide at a glance what amounts to a panoramic view of the use of physical plant at each planning stage. The location of each department can be readily established; the occupancy pattern of each building also can be readily observed.

D. Building Program

At this point, it is possible to express the sequence for dealing with the various components of the building program. Worksheet 19.6 focuses on existing structures. All existing structures are listed and their treatment at each planning stage is indicated. The gross area of the building, the planning stage at which the particular project is to be begun, and the character of the project can be indicated. Demolition and major remodeling projects in existing physical facilities should be dealt with on this worksheet.

Worksheet 19.7 calls for the exposition of the new construction portion of the building program. Each new building or addition to existing structures should be listed in order of priority. The planning stages at which new construction must be ready for occupancy should be indicated here. The worksheet also permits conversion of the program area requirements of the new building to gross area. The coefficient to be used in converting from net area to gross area will depend upon the nature of the building project, the amount of construction involved and, ultimately, the design of the new building. However, for planning purposes the conversion coefficients listed in table 19.1 may be used in estimating the gross area of construction involved in implementing each new building project.

E. Summary of Building Program

Various types of summaries of the recommended building program will be found useful. Worksheet 19.8 permits the development of summaries of net and gross building area in the base period and at the several planning stages used in the programming study. Sub-studies of the amounts of space in a) academic and general facilities and b) housing and other revenue-financed facilities are provided for in this worksheet. In addition to providing a summary of the total amounts of net and gross area available at each stage of institutional development, the worksheet permits the calculation of the area per student at each planning stage. This is a general index of the effects of the programming procedure, the physical and policy planning criteria used, and the changing mix of instruction, research, and non-academic activities accommodated on campus. However, this is an analytical gauge only; it has no significance for predicting institutional plant capacity and should not be used for estimating building space requirements.

Worksheet 19.9 provides another summary view of the building program. The worksheet is designed to show the changing pattern in the allocation of physical plant by major type of space as the building program progresses through several stages of institutional growth. Net changes in each space component, both additions and reductions, are shown in this worksheet. Thus, another view is provided of the changing mix in the composition of physical plant over the planning interval comprehended by the programming study.

TABLE 19.1; BUILDING PROGRAM SUMMARY

Recommended Coefficients for Converting Program (Gross) Area Estimates to Gross (Program) Area Estimates for New Buildings and Additions to Existing Structures

	Building Group		Conversion Coefficient	
			Gross-to-Net: (a.s.f./g.s.f.)	Net-to-Gross: (g.s.f./a.s.f.)
		1	2	3
1	Type 1:	High Density: buildings with heavy student traffic, offices, classrooms, smaller labs, extensive mechanical equipment	0.60	1.67
2	Type 2:	Medium Density: libraries, larger laboratories, large interior open spaces.	0.70	1.43
3	Type 3:	Low Density: gymnasiums, large lecture halls, large reading rooms, large engineering labs, warehousing, shops, greenhouses, barns	0.80	1.25

WORKSHEET 19.1; BUILDING PROGRAM SUMMARY

Comparison of Aggregate Program Area Requirements and Net Space
Available in Existing Physical Plant to Obtain First
Approximation of Over-all Deficit (Surplus) of Usable
Space and Size of Construction Program Required to
Remedy Deficiencies

Institution ______________________________

____

		Planning Stage					
		I	II	III	IV	V	VI
	Space Category			(square feet)			
	1	2	3	4	5	6	7
1	Academic and general facilities[a]:						
2	Aggregate program area requirements						
3	Net space available in existing physical plant						
4	Net deficit (surplus)						
5	Housing and other revenue-financed facilities:						
6	Aggregate program area requirements						
7	Net space available in existing physical plant						
8	Net deficit (surplus)						
9	All facilities:						
10	Aggregate program area requirements						
11	Net space available in existing physical plant						
12	Net deficit (surplus)						

(Continued)

WORKSHEET 19.1 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 17.3
Line 3: Worksheet 18.3, Col. 4
Line 4: Line 2 - line 3
Line 5: No entry
Line 6: Worksheet 17.3
Line 7: Worksheet 18.3, Col. 4
Line 8: Line 6 - line 7
Line 9: No entry
Line 10: Worksheet 17.3
Line 11: Worksheet 18.3, Col. 4
Line 12: Line 10 - line 11

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] The planning analyst's judgment is required in determining which components of physical plant requirements fall into the two main categories: academic and general facilities; housing and other revenue-financed facilities.

WORKSHEET 19.2; BUILDING PROGRAM SUMMARY

Establishment of Priority Ranking in Building Program

Institution________________ Base Period[a]____________ Planning Stage[a]____________

				Space Deficit		Priority of Need: Departmental Rank		
	Department or Department Group	Net Area Allocation in Base Period (square feet)	Program Area Requirements in Target Period (square feet)	Square Feet	Percent of Base Period Allocation	By Absolute Size of Deficit	By Relative Size of Deficit	Use[b]
	1	2	3	4	5	6	7	8
1								
2	-----							
3								
4								
5								
6								
7								
8								
9								
.								
.								
.								
n								

(Continued)

WORKSHEET 19.2 (Continued)

DATA SOURCES:

Col. 1: Worksheet 17.3 and, to the extent that department groups are considered, the planning analyst
Col. 2: Worksheet 18.4
Col. 3: Worksheet 17.3 and, to the extent that department groups are considered, the planning analyst.
Col. 4: Col. 3 - Col. 2
Col. 5: Col. 4 ÷ Col. 2
Col. 6: Planning analyst; based upon data in Col. 4
Col. 7: Planning analyst; based upon data in Col. 5
Col. 8: Planning analyst; as a point of departure in developing the entries for column 8, the product of columns 6 and 7 may be used

---

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] Enter the required information identifying the periods under consideration. The worksheet is organized to permit analysis of priority of need between any two intervals. These may be successive intervals (e.g., planning stages I and II) or not (e.g., base period and planning stage VI). The planning analyst can decide the frame of reference.

[b] As a point of departure in developing the entries for column 8, the product of columns 6 and 7 may be obtained. The results may be used as a rough indicator of the departmental rank in order of magnitude of relative need weighted by absolute size of need. However, this measure would then require further evaluation by the planning analyst to allow for factors not readily measured statistically (e.g., quality of space presently occupied).

WORKSHEET 19.3; BUILDING PROGRAM SUMMARY

Building ________; Worksheet for Developing the Recommended Space Allocation Pattern at the Specified Planning Stage, by Space Category (Function) and Occupant (Department)[a]

Institution ________ Planning Stage ________ Budget Category[b] ________ Building Status[c] ________

	Department					
Space Category	D.1	D.2	D.3 (square feet)	D.4	....	Total
1	2	3	4	5	....	n
1 Classroom						
2 Special purpose instructional						
3 Office						
4 Research						
5 Library						
6 Museum and gallery						
7 Athletic activities						
8 Housing						
9 Food service						
10 Staff and student service						
11 Miscellaneous other						

(Continued)

WORKSHEET 19.3 (Continued)

	Department					
Space Category	D.1	D.2	D.3	D.4	....	Total
			(square feet)			
1	2	3	4	5	....	n
12 Physical plant maintenance and operations						
13 Total program area						
14 Net available area						
15 Deficit (-) or surplus (+)						

DATA SOURCES:

Line 1: Planning analyst and worksheet series 17.2
Line 2: Planning analyst and worksheet series 17.2
Line 3: Planning analyst and worksheet series 17.2
Line 4: Planning analyst and worksheet series 17.2
Line 5: Planning analyst and worksheet series 17.2
Line 6: Planning analyst and worksheet series 17.2
Line 7: Planning analyst and worksheet series 17.2
Line 8: Planning analyst and worksheet series 17.2
Line 9: Planning analyst and worksheet series 17.2
Line 10: Planning analyst and worksheet series 17.2
Line 11: Planning analyst and worksheet series 17.2
Line 12: Planning analyst and worksheet series 17.2
Line 13: Sum of lines 1 to 12
Line 14: Worksheet series 18.3, Col. 4; may be zero for new buildings
Line 15: Line 14 - line 13

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] A separate worksheet is required for each existing and proposed new building.

[b] Indicate whether a) academic and general facility, b) housing or other revenue-financed facility.

[c] Specify one of following: existing; addition; new building.

WORKSHEET 19.4; BUILDING PROGRAM SUMMARY

Department __________; Worksheet for Summarizing the Recommended Space Locational Pattern at the Specified Planning Stage, by Space Category (Function) and Building (Location)

Institution ______________________________ Planning Stage ______________________________

Space Category	Program Area Requirement	Building Location[a]					
		B.1 ___	B.2 ___ (square feet)	B.3 ___	B.4 ___	B.5 ___	Total
1	2	3	4	5	6	7	8
1 Classroom							
2 Special purpose instructional							
3 Office							
4 Research							
5 Library							
6 Museum and gallery							
7 Athletic activities							
8 Housing							
9 Food service							
10 Staff and student service							
11 Miscellaneous other							

(Continued)

WORKSHEET 19.4 (Continued)

			Building Location[a]					
	Space Category	Program Area Requirement	B.1 ___	B.2 ___ (square feet)	B.3 ___	B.4 ___	B.5 ___	Total
	1	2	3	4	5	6	7	8
12	Physical plant maintenance and operations							
13	Total							

DATA SOURCES:

Col. 1: Worksheet series 17.2
Col. 2: Worksheet series 17.2
Col. 3: Worksheet series 19.3
Col. 4: Worksheet series 19.3
Col. 5: Worksheet series 19.3
Col. 6: Worksheet series 19.3
Col. 7: Worksheet series 19.3
Col. 8: Worksheet series 19.3

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Specify building name.

WORKSHEET 19.5; BUILDING PROGRAM SUMMARY

Master Worksheet for Summarizing the Allocation of Departmental Program Area Requirements Among Existing and Projected Buildings, by Department and Building[a,c]

Institution____________________ Planning Stage____________________

	Department	Total Program Area Requirements	Building Occupancy Pattern[b]					
			B.1 ___	B.2 ___	B.3 ___	B.4 ___	....	B.n ___
			(square feet)					
	1	2	3	4	5	6	....	n
1								
2								
3								
4								
5								
6								
7								
.								
.								
.								
n-3								
n-2	Total program area							
n-1	Net available area							
n	Deficit (-) or surplus (+)							

(Continued)

WORKSHEET 19.5 (Continued)

DATA SOURCES:

Line 1: Worksheet series 19.4
Line 2: Worksheet series 19.4
Line 3: Worksheet series 19.4
Line 4: Worksheet series 19.4
Line 5: Worksheet series 19.4
Line 6: Worksheet series 19.4

Col. 1: Worksheet series 17.3
Col. 2: Worksheet series 17.3

Line 7: Worksheet series 19.4
Line n-3: Worksheet series 19.4
Line n-2: Sum of lines 1 to n-3
Line n-1: Worksheet series 18.3, Col. 4
Line n: Line "n-1" - line "n-2"

Col. 3-Col. n: Worksheet series 19.4

PREPARED:	APPROV:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] All figures are expressed in square eet.

[b] Specify name of building.

[c] This worksheet is optional. It is mply a master summary sheet and may be too cumbersome for large institutions. All contents o this table should already have been expressed in worksheet series 19.3 and 19.4.

WORKSHEET 19.6; BUILDING PROGRAM SUMMARY

Existing Structures: Demolition and Major Remodeling Projects

Institution________________________

					Nature of Project[d]	
	Building[a]	Planning Stage[b]	Budget Category[c]	Gross Area (square feet)	Demolition	Remodeling
	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
.						
.						
.						
m						

DATA SOURCES:

Col. 1: Worksheet series 19.3
Col. 2: Worksheet series 19.3
Col. 3: Worksheet series 19.3
Col. 4: Worksheet 18.2
Col. 5: Worksheet series 19.3 and planning analyst
Col. 6: Worksheet series 19.3 and planning analyst

(Continued)

WORKSHEET 19.6 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date________________	Date________________	Date________________

TECHNICAL NOTES:

[a] Buildings should be listed in order of priority of project. The ennumeration should reflect the judgment expressed in worksheet series 19.2 and 19.3.

[b] Specify stage by which project must be completed.

[c] Indicate whether a) academic and general facility, or b) housing or other revenue- financed facility.

[d] Check one column or the other to specify whether project involves demolition or remodeling.

WORKSHEET 19.7; BUILDING PROGRAM SUMMARY

New Buildings and Additions to Existing Structures: Conversion of Program Area Estimates to Gross Area Requirements

Institution ______________________

	Building[a] 1	Planning Stage[b] 2	Budget Category[c] 3	Program Area Requirements (square feet) 4	Conversion Coefficient: Gross Area/Net Area 5	Gross Area Requirements (square feet) 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
.						
.						
.						
m						

(Continued)

WORKSHEET 19.7 (Continued)

DATA SOURCES:

Col. 1: Worksheet series 19.3
Col. 2: Worksheet series 19.3
Col. 3: Worksheet series 19.3
Col. 4: Worksheet series 19.3, line 15
Col. 5: Table 19.1, Col. 3; or planning analyst's judgment, if listed planning criteria are not considered applicable
Col. 6: Col. 4 x Col. 5

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] Buildings should be listed in order of priority of need. The enumeration should reflect the judgment expressed in worksheet series 19.2 and 19.3.

[b] Specify stage at which building is to be ready for occupancy.

[c] Indicate whether a) academic and general facility, or b) housing or other revenue-financed facility.

WORKSHEET 19.8; BUILDING PROGRAM SUMMARY

Summary of Net and Gross Building Area Requirements, by Planning Stage

Institution______________________________

	Category	Base Period: 196_	Funded: 196_	Planning Stage (square feet)					
				I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8	9
1	Enrollment: full-time equivalent								
2	Academic and general facilities:								
3	Net area:								
4	Scheduled additions								
5	Cumulative total								
6	Net area per FTE student								
7	Gross area:								
8	Scheduled additions								
9	Cumulative total								
10	Gross area per FTE student								

(Continued)

WORKSHEET 19.8 (Continued)

				Planning Stage					
	Category	Base Period: 196_	Funded: 196_	I	II	III	IV	V	VI
				(square feet)					
	1	2	3	4	5	6	7	8	9
11	Housing and other revenue-financed facilities:								
12	Net area:								
13	Scheduled additions								
14	Cumulative total								
15	Net area per FTE student								
16	Gross area:								
17	Scheduled additions								
18	Cumulative total								
19	Gross area per FTE student								
20	All facilities:								
21	Net area:								
22	Scheduled additions								
23	Cumulative total								
24	Net area per FTE student								

(Continued)

WORKSHEET 19.8 (Continued)

	Category	Base Period: 196_	Funded: 196_	Planning Stage					
				I	II (square feet)	III	IV	V	VI
	1	2	3	4	5	6	7	8	9
25	Gross area:								
26	Scheduled additions___	______	______	______	______	______	______	______	______
27	Cumulative total______	______	______	______	______	______	______	______	______
28	Gross area per FTE student______	______	______	______	______	______	______	______	______

DATA SOURCES:

Line 1: Worksheet 2.1
Line 2: No entry
Line 3: No entry
Line 4: Worksheets 18.1, 18.2, 19.6 and 19.7
Line 5: Planning analyst's calculations, based on entries on line 4
Line 6: Line 5 + line 1
Line 7: No entry
Line 8: Worksheets 18.1, 18.2, 19.6 and 19.7
Line 9: Planning analyst's calculations, based on entries on line 8
Line 10: Line 9 + line 1
Line 11: No entry
Line 12: No entry
Line 13: Worksheets 18.1, 18.2, 19.6 and 19.7
Line 14: Planning analyst's calculations, based on entries on line 13
Line 15: Line 14 + line 1
Line 16: No entry
Line 17: Worksheets 18.1, 18.2, 19.6 and 19.7

(Continued)

WORKSHEET 19.8 (Continued)

DATA SOURCES (continued)

Line 18: Planning analyst's calculations, based on entries on line 17
Line 19: Line 18 ÷ line 1
Line 20: No entry
Line 21: No entry
Line 22: Worksheets 18.1, 18.2, 19.6 and 19.7
Line 23: Planning analyst's calculations, based on entries on line 22
Line 24: Line 23 ÷ line 1
Line 25: No entry
Line 26: Worksheets 18.1, 18.2, 19.6 and 19.7
Line 27: Planning analyst's calculations, based on entries on line 26
Line 28: Line 27 ÷ line 1

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

WORKSHEET 19.9; BUILDING PROGRAM SUMMARY

Summary of Net Area Allocations of Physical Plant as Building Program Progresses, by Space Category

Institution ____________________

		Net Changes in Physical Plant[a]					
		Planning Stage ___[b]			Planning Stage ___[b]		
Space Category 1	Basé Period Allocation 2	Additions 3	Reductions 4	Net Available 5	Additions 6	Reductions 7	Net Available 8
1 Classroom							
2 Special purpose instructional							
3 Office							
4 Research							
5 Library							
6 Museum and gallery							
7 Athletic activities							
8 Housing							
9 Food service							
10 Staff and student service							
11 Miscellaneous other							

(Continued)

WORKSHEET 19.9 (Continued)

	Space Category	Net Changes in Physical Plant[a]						
		Base Period Allocation	Planning Stage ___[b]			Planning Stage ___[b]		
			Additions	Reductions	Net Available	Additions	Reductions	Net Available
	1	2	3	4	5	6	7	8
12	Physical plant maintenance and operations___	___	___	___	___	___	___	___
13	Unassigned___	___	___	___	___	___	___	___
14	Total___	___	___	___	___	___	___	___

DATA SOURCES:

Col. 1: Worksheet 18.1
Col. 2: Worksheet 18.1
Col. 3: Worksheet series 19.3
Col. 4: Worksheet series 19.3
Col. 5: Col. 2 + Col. 3 - Col. 4
Col. 6: Worksheet series 19.3
Col. 7: Worksheet series 19.3
Col. 8: Col. 5 + Col. 6 - Col. 7

PREPARED:
By___
Date___

APPROVED:
By___
Date___

SUBMITTED:
By___
Date___

TECHNICAL NOTES:

[a] In square feet.

[b] Specify planning stage.

PART V

LAND REQUIREMENTS

CHAPTER 20

LAND REQUIREMENTS

Campus resources include both physical plant and land. And in the same way that physical plant requirements are amenable to orderly programming, campus land requirements can also be dealt with in a systematic and comprehensive fashion. The method is essentially the same as that underlying the development of the physical plant program.

Analytically, the procedure for estimating land requirements takes the following form. First, campus land is divided into several functional categories for purposes of analysis. Second, the intensity of land demand associated with each functional category is determined. This is analogous to the determination of the workloads associated with each component of physical plant when programming physical plant requirements. Third, policy planning assumptions are introduced regarding a) intensity of land use and b) unit area physical planning criteria for the allocation of land to different purposes. Fourth, the planning criteria are combined with the workload estimates to arrive at a program of land requirements. Fifth, reference is made to the inventory of current campus land holdings and land availability is compared with projected land requirements. The existence of a deficit (or surplus) in land resources is ascertained and an approximation of the order of magnitude of the deficit (or surplus) can be established. Sixth, a program is evolved for acquiring additional land resources. Finally, a program for using future campus land resources, both existing and acquired, is developed. This includes the following statements: a) the amount of land required, b) the planning stage at which land acquisitions must be made, and c) the use of campus land at each planning stage.

For purposes of this programming study, land use is divided into four broad categories: building sites; outdoor athletic and physical education activity areas; parking; and circulation and other uses. Further sub-classification is possible, but bearing in mind the objectives of the Manual the fourfold classification enumerated above should prove sufficient.

A. Building Sites

Worksheet 20.1 deals with the projection of acreage requirements for the accommodation of buildings. For each planning stage, the gross floor space of physical plant has already been determined. Therefore, only two further variables must be identified in order to estimate the acreage requirements for building sites. These variables are a) the average number of floor levels per building,and b) the building density factor. The estimate of the average number of floor levels (including basements) that will prevail across the campus should reflect a consideration of a) the character of existing campus architecture, and b) the appropriateness of high-rise or low-rise construction for various types of buildings. Thus, it is desirable to keep classrooms and laboratories within three floor levels while offices, dormitories and family apartments may be built in high-rise structures. If no high-rise structures are likely, an average of 3.5 floors is common for campus-type college development. Some presence of high-rise construction may raise the average to 4 floors. A dense urban campus may average 5 but seldom more than 6 floor levels; this is because of the need at class change time to keep heavy student traffic on lower levels, thereby

avoiding some of the problems of providing for peak load elevator s
to classrooms and laboratories.

The density of building coverage refers to the proportion of l
area within a building zone actually covered by structures. Exclud
parking and playfield areas but including all other open space on
the typical "campus" may reach 30 percent ground coverage but usual
ages about 20 percent.

In analyzing building density, it should be kept in mind that
building facilities should be grouped within an area which may be
within six minutes walking time (normal class change interval less
minutes) or a diameter of 1,600 feet. This comprehends a zone of
2 million square feet, or approximately 46 acres, and is a maximum
within which academic buildings should be concentrated. In 46 acr
at 20 percent ground coverage, and with buildings averaging 3.5 fl
total of 1.4 million gross square feet of buildings can be accomm
Higher density is required to maintain the six-minute walking spa
more than 1.4 million square feet of buildings. Parking, physical
tion and athletic fields, research installations and housing requ
tional land on the periphery of the central core. The density fa
should be determined after considering the degree of compactness
to accommodate academic buildings, housing, special research faci
and other land-consuming facilities within a reasonable distance
another.

B. Land for Athletic and Physical Education Activities

The second campus land component to be analyzed separately acreage devoted to outdoor athletic and physical education programs. Worksheets 20.2 through 20.7 are devoted to programming the land requirements associated with outdoor athletic programs. Here the analysis virtually parallels that developed in connection with programming indoor athletic activities space.

Worksheets 20.2 through 20.4 should be used to project the workloads associated with outdoor athletic programs.

In worksheet 20.5, the projected activity levels are first converted to estimates of capacity requirements and then combined with unit area allocation criteria to arrive at estimates of the total land required to accommodate outdoor athletic programs. Physical planning criteria appropriate to determining outdoor athletic activity facilities are provided in table 20.1.

Worksheet 20.6 focuses upon the question of the capacity and acreage required to satisfy the needs for spectator seating at outdoor athletic events.

And worksheet 20.7 summarizes the aggregate campus acreage required to meet the need for playing fields and activity areas and spectator seating at each planning stage.

C. Parking

The third campus land category separated for analysis is that associated with parking facilities. The acreage required for parking is partly a function of the size of the campus population and partly a function of the rate at which it uses automobiles and requires parking accommodation on campus. Of course, parking space for students and staff would have to be augmented to meet the needs of campus visitors as well.

In worksheet 20.8, the number of parking spaces required to satisfy staff, student and visitor needs should be analysed. Once these workload characteristics are established, the total acreage required for vehicle parking may be obtained by combining the projected load factor with the planning criteria for the number of vehicles that can be accommodated per acre. The latter is suggested in table 20.1.

D. Aggregate Land Requirements

Worksheet 20.9 will permit the determination of the amount of additional land necessary to satisfy aggregate campus acreage requirements at each planning stage. As a first step, the total acreage required for building sites, outdoor athletic and physical education activities and parking should be established. To obtain aggregate land requirements, this figure should then be increased by the amount of land required for circulation and other purposes. This will vary with density characteristics, campus location (rural-urban), institutional policy on parking permits, resident-commuter student mix, and so on. A reasonable assumption would put circulation and other land uses at about 20-30 percent of total acreage on a moderately built-up campus, or about 25-40 percent of the land devoted to the above three land-use components. Then, by comparing available land with projected acreage requirements the net deficit or amount of additional land that must be acquired can be determined.

It should be noted that land must be acquired far in advance of need for perpetual institutions of higher education. Therefore, the land acquisition program to be funded during the planning period under consideration should provide land as much as 20 to 40 years ahead of need, especially if the availability of such land is declining and/or the difficulty of acquiring land is increasing. The enumeration of land acquisition items should therefore be extended to include purchases for long-range growth, regardless of the computed amounts to be actually used within the planning period. A separate justification for these additional acquisitions should be appended to worksheet 21.3 (which deals with the capital outlay projections for land acquisition).

TABLE 20.1: LAND REQUIREMENTS

Recommended Planning Criteria for Use in the Allocation of Land to Selected Uses

Item 1	Planning Criterion 2
Swimming pool	.16 acres per unit
Track	4.00 acres per unit
Baseball field	2.50 acres per field
Softball field	.92 acres per field
Football field (touch)	1.16 acres per field
Soccer field	1.06 acres per field
Archery	.07 acres per line
Hockey rink	.49 acres per rink
Volleyball court	.07 acres per court
Basketball court	.18 acres per court
Tennis court	.17 acres per court
Stadium:	
Football field	1.74 acres
Spectator seating	4 square feet per seat
Parking space:	
Compact cars	180 vehicles per acre
Standard cars	132 vehicles per acre

WORKSHEET 20.1: LAND REQUIREMENTS

Estimate of Campus Acreage Required for Allocation to Building Sites, by Planning Stage

Institution______________________________

	Item	Base Period	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Academic and general facilities:							
2	Gross floor space of physical plant (square feet)							
3	Average number of floor levels							
4	Net site coverage (square feet)							
5	Building density factor							
6	Gross site requirements:							
7	Square feet							
8	Acres							
9	Housing and other revenue-financed facilities:							
10	Gross floor space of physical plant (square feet)							
11	Average number of floor levels							

(Continued)

WORKSHEET 20.1 (Continued)

	Item	Base Period	Planning Stage I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
12	Net site coverage (square feet)							
13	Building density factor							
14	Gross site requirements:							
15	Square feet							
16	Acres							
17	Total acreage required for buildings							

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 19.8
Line 3: Planning analyst's judgment
Line 4: Line 2 × line 3
Line 5: Policy planning assumption
Line 6: No entry
Line 7: Line 4 × line 5
Line 8: Line 7 ÷ 43560 (conversion factor: 43560 square feet per acre)
Line 9: No entry
Line 10: Worksheet 19.8
Line 11: Planning analyst's judgment
Line 12: Line 10 × line 11
Line 13: Policy planning assumption
Line 14: No entry
Line 15: Line 12 × line 13
Line 16: Line 15 ÷ 43560 (conversion factor: 43560 square feet per acre)
Line 17: Line 8 + line 16

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

WORKSHEET 20.2; LAND REQUIREMENTS

Summary of Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity; Base Year, 196_-6_

Institution__________________ Sex_______________ Season[a]_________

	Activity Level: Student and/or Staff Periods[b]					
Type of Activity 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
1 Swimming-diving						
2 Track						
3 Baseball						
4 Softball						
5 Football						
6 Soccer						
7 Archery						
8 Hockey						
9 Volleyball-basketball						
10 Tennis						
11 Stadium						

(Continued)

WORKSHEET 20.2 (Continued)

		Activity Level: Student and/or Staff Periods[b]					
	Type of Activity 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
12	Other						
13	Other						
14	Other						
15	Total						

DATA SOURCES:

All data are from institutional records.

PREPARED:

By__________

Date__________

APPROVED:

By__________

Date__________

SUBMITTED:

By__________

Date__________

TECHNICAL NOTES:

[a] Fall; winter; spring.

[b] The data on activity levels should be adjusted to reflect desired activity levels in instances where absence of facilities has artificially depressed workloads.

WORKSHEET 20.3; LAND REQUIREMENTS

Indexes of Growth for Use in Projecting Changes in Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity

Institution__________ Planning Stage__________ Sex__________

		Indexes of Growth in Activity Levels: Base Year to Stage __[a]					
	Type of Activity 1	Base Year: 196_-6_ 2	Required Physical Education 3	Professional Programs 4	Intramural Programs 5	Non-organized (casual) 6	Intercollegiate 7
1	Swimming-diving	1.000					
2	Track	1.000					
3	Baseball	1.000					
4	Softball	1.000					
5	Football	1.000					
6	Soccer	1.000					
7	Archery	1.000					
8	Hockey	1.000					
9	Volleyball-basketball	1.000					
10	Tennis	1.000					
11	Stadium	1.000					

(Continued)

WORKSHEET 20.3 (Continued)

		Indexes of Growth in Activity Levels: Base Year to Stage ___[a]					
	Type of Activity 1	Base Year: 196_-6_ 2	Required Physical Education 3	Professional Programs 4	Intramural Programs 5	Non-organized (casual) 6	Intercollegiate 7
12	Other__________	1.000	________	________	________	________	________
13	Other__________	1.000	________	________	________	________	________
14	Other__________	1.000	________	________	________	________	________

DATA SOURCES:

Col. 1: Worksheet 20.2
Col. 2: Policy planning assumption
Col. 3: Policy planning assumption
Col. 4: Policy planning assumption
Col. 5: Policy planning assumption
Col. 6: Policy planning assumption
Col. 7: Policy planning assumption

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] An explanation should be appended where something other than staff and student expansion has been used as the basis for establishing the indexes of growth.

7

WORKSHEET 20.4; LAND REQUIREMENTS

Projection of Activity Levels in Outdoor Athletic and Physical Education Programs, by Type of Activity

Institution__________ Planning Stage__________ Sex_____ Peak Period[a]__________

		Activity Level: Student and/or Staff Periods					
	Type of Activity 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
1	Swimming-diving						
2	Track						
3	Baseball						
4	Softball						
5	Football						
6	Soccer						
7	Archery						
8	Hockey						
9	Volleyball-basketball						
10	Tennis						
11	Stadium						

(Continued)

WORKSHEET 20.4 (Continued)

		Activity Level: Student and/or Staff Periods					
	Type of Activity 1	Required Physical Education 2	Professional Programs 3	Intramural Programs 4	Non-organized (casual) 5	Intercollegiate 6	Total 7
12	Other________						
13	Other________						
14	Other________						
15	Total________						

DATA SOURCES:

Col. 1: Worksheet 20.2
Col. 2: Worksheet 20.2, column 2 x worksheet 20.3, column 3
Col. 3: Worksheet 20.2, column 3 x worksheet 20.3, column 4
Col. 4: Worksheet 20.2, column 4 x worksheet 20.3, column 5
Col. 5: Worksheet 20.2, column 5 x worksheet 20.3, column 6
Col. 6: Worksheet 20.2, column 6 x worksheet 20.3, column 7
Col. 7: Sum of columns 2, 3, 4, 5 and 6

PREPARED:
By________________
Date________________

APPROVED:
By________________
Date________________

SUBMITTED:
By________________
Date________________

TECHNICAL NOTES:

[a] Season.

WORKSHEET 20.5; LAND REQUIREMENTS

Projection of Capacity and Land Requirements for Outdoor Athletic and Physical Education Programs, by Type of Activity

Institution__________ Planning Stage__________ Sex________ Peak Period[a]__________

						Land Requirements	
	Activity Group 1	Activity Level: Student and/or Staff Periods 2	Maximum Number of Persons per Station 3	Capacity Requirements: Number of Stations 4	Unit Area Allocation per Station (square feet) 5	Square Feet 6	Acres 7
1	Swimming-diving						
2	Track						
3	Baseball						
4	Other playing fields:						
5	Softball						
6	Football						
7	Soccer						
8	Archery						
9	Subtotal						
10	Hockey						

(Continued)

WORKSHEET 20.5 (Continued)

	Activity Group	Activity Level: Student and/or Staff Periods	Maximum Number of Persons per Station	Capacity Requirements: Number of Stations	Unit Area Allocation per Station (square feet)	Land Requirements	
						Square Feet	Acres
	1	2	3	4	5	6	7
11	Volleyball-basketball						
12	Tennis						
13	Stadium						
14	Other						
15	Other						
16	Total						

DATA SOURCES:

Col. 1: Worksheet 20.2
Col. 2: Worksheet series 20.4
Col. 3: Policy planning assumption
Col. 4: Column 2 ÷ column 3
Col. 5: Table 20.1
Col. 6: Column 4 x column 5
Col. 7: Column 6 ÷ 43560 (conversion factor: 43560 square feet per acre)

PREPARED:
By__________
Date__________

APPROVED:
By__________
Date__________

SUBMITTED:
By__________
Date__________

TECHNICAL NOTES:

[a] Season.

WORKSHEET 20.6; LAND REQUIREMENTS

Projection of Capacity and Land Requirements for Outdoor Athletic Program Spectator Seating, by Type of Activity

Institution ____________________ Planning Stage ____________________

		Type of Activity						
	Item	Football	Track	Baseball	Swimming	Hockey	Other	Total
	1	2	3	4	5	6	7	8
1	Spectator seats used at public events in 196_-6_:							
2	Average per event							
3	Percent of student and staff population							
4	Index of growth in student and staff population: 196_-6_ ÷ 1.000							
5	Spectator seats required:							
6	First approximation							
7	Adjusted[a]							
8	Unit area allocation criterion (square feet)							
9	Land requirements:							
10	Square feet							
11	Acres							

(Continued)

WORKSHEET 20.6 (Continued)

DATA SOURCES:

Line 1: No entry
Line 2: Institutional records
Line 3: Line 2 ÷ total student and staff population
Line 4: Policy planning assumption
Line 5: No entry
Line 6: Line 2 x line 4
Line 7: Line 6 adjusted by planning analyst in accordance with Technical Note "a"
Line 8: Table 20.1
Line 9: No entry
Line 10: Line 7 x line 8
Line 11: Line 10 ÷ 43560 (conversion factor: 43560 square feet per acre)

PREPARED:

By________________

Date________________

APPROVED:

By________________

Date________________

SUBMITTED:

By________________

Date________________

TECHNICAL NOTES:

[a] Explain basis of adjustment. It should also be noted that the entries should be net of duplication. I.e., excluding seats already included or tabulated for other activity.

WORKSHEET 20.7; LAND REQUIREMENTS

Estimate of Campus Acreage Required for Allocation to Outdoor Athletic and Physical Education Programs, by Planning Stage

Institution________________________

	Item	Base Period	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Playing fields and activity areas							
2	Spectator seating							
3	Total acreage required							

DATA SOURCES:

Line 1: Worksheet series 20.5
Line 2: Worksheet series 20.6
Line 3: Line 1 + line 2

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

WORKSHEET 20.8; LAND REQUIREMENTS

Estimate of Campus Acreage Required for Allocation to Parking

Institution______________________

	Item	Base Period	Planning Stage					
			I	II	III	IV	V	VI
	1	2	3	4	5	6	7	8
1	Staff facilities:							
2	Number of persons							
3	Persons per vehicle parking space							
4	Number of parking spaces required							
5	Student facilities:[a]							
6	Number of persons							
7	Persons per vehicle parking space							
8	Number of parking spaces required							
9	Visitor and other facilities: number of parking spaces required							
10	Total parking spaces required							
11	Number of parking spaces per acre							
12	Total acreage required for parking							

DATA SOURCES:

Line 1: No entry
Line 2: Worksheet 4.7
Line 3: Policy planning assumption
Line 4: Line 2 ÷ line 3
Line 5: No entry
Line 6: Worksheet 2.4
Line 7: Policy planning assumption
Line 8: Line 6 ÷ line 7
Line 9: Planning analyst's judgment. Include extra parking for athletic events.
Line 10: Sum of lines 4, 8 and 9
Line 11: Table 20.1
Line 12: Line 10 ÷ line 11

(Continued)

WORKSHEET 20.8 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date______________	Date______________	Date______________

TECHNICAL NOTES:

[a] A more detailed analysis may be required at some institutions in order to differentiate among the needs of various classes of students (e.g., commuters-day, commuters-evening, residents).

WORKSHEET 20.9; LAND REQUIREMENTS

Summary of Aggregate Campus Acreage Requirements, by Land Use Category and Planning Stage

Institution____________________________

		Planning Stage					
Land Use Category	Base Period	I	II	III	IV	V	VI
1	2	3	4	5	6	7	8
1 Building sites							
2 Outdoor athletic and physical education activities							
3 Parking							
4 Subtotal							
5 Circulation and other							
6 Total land requirements							
7 Land available on existing campus							
8 Net deficit (surplus) or required acquisitions							

DATA SOURCES:

Line 1: Worksheet 20.1
Line 2: Worksheet 20.7
Line 3: Worksheet 20.8
Line 4: Sum of lines 1, 2 and 3
Line 5: Line 6 - line 4
Line 6: Line 4 ÷ planning assumption for proportion of total campus area to be allocated to building sites, athletic activities and parking
Line 7: Institutional records and/or land use survey
Line 8: Line 7 - line 6

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

PART VI

CAPITAL BUDGETING

CHAPTER 21

CAPITAL OUTLAY PROJECTIONS

The final step in this procedure is to determine the long-range capital outlay requirements of the institution, according to the projected requirements for new buildings, major remodeling and nonbuilding capital projects. The procedure for estimating capital outlay requirements is geared (with some minor variations) to existing procedures of the State Planning Division and the State Budget Office. The Five-Year Moving Capital Budget programs called for in the state's Capital Construction procedure may be directly derived from the estimates made in this chapter. However, since an immediate purpose of this procedure is to provide the basis for a continuing capital funding system for higher education over a longer period of time, the estimates called for here will span up to ten years, depending upon the expected timing of the final planning stage. At this point, a final check should be made that the "enrollment projection-planning stage" correlation made in worksheet 2.1 is still consistent with most recent demographic analyses. If not, appropriate revisions should be made in order that the capital outlay projections reflect the actual dates at which the planning stages are expected to be reached.

A. Project Scheduling

In scheduling the capital outlay program on a fiscal year basis, major building projects should be funded over a three-year sequence: first year, planning and design funds; second year, construction funds; third year, movable furniture and equipment funds. This means, for example that a building needed for the enrollment level expected in Fall 1968 would be funded as follows: planning and design, 1965-66; construction, 1966-67; equipment, 1967-68. The planning and construction schedule would work out approximately as indicated in table 21.1.

This schedule suggests that nearly four years are required from preliminary programming through the completion and acceptance of a major building. If this kind of schedule is to be maintained, it is clear that an institution must have the machinery for developing a "program" for a building project before an architect is hired; this program is needed as the basis for the initial request for planning and design funds which must be filed by July 1, 1964 for a building to be completed by 1968. It also is apparent, since at least a full year should be allowed for architectural plans and working drawings, that the first year's appropriation should cover the cost of architectural and engineering services through the preparation of complete bidding documents, working drawings and specifications, so that bidding on construction may be initiated as soon as construction funds are appropriated. On most larger projects, 18 months should be allowed for the construction period. The timing of this sequence is such that buildings usually will be occupied in the winter; a preferable time would be the summer before the fall term in which the building will be most needed. However, since delays are inevitable under any system, scheduling along the lines outlined above is reasonable. Completion of a building in the winter will leave time during the spring and summer for remodeling of vacated space for new functions and permit occupancy by the following fall term.

B. Demolition and Major Remodeling Projects

As computations of building area requirements were made in previous sections, the determination was made of how existing buildings are to be used at future planning stages. Changes in the functions of older buildings are an inevitable part of institutional growth as some departments move into new buildings and as other departments grow into vacated space. Generally, extensive remodeling of older buildings is required when such changes occur. Other older buildings simply have worn out and need to be rehabilitated with new lighting and electrical systems, improved heating and ventilation, new floor covering, and the like. Finally, for a variety of reasons, some buildings must be demolished. Major demolition and remodeling projects[a] that will be required over the planning period have been compiled in worksheet 19.6. These should be evaluated in relation to the expected cost of the remodeling required and enumerated in worksheet 21.1.

Major remodeling costs will vary according to the extent of interior changes to be made. When a science department moves into space used previously only for offices and classrooms, remodeling for laboratories requires extensive reconstruction of interior partitions, often strengthened floor loading capacities, completely new utilities, extensive ventilation equipment, and fixed hoods and benches. For this reason, and because space requirements in the sciences change more rapidly, it is good practice to assign older space to nonlaboratory functions. Conversely, when science departments move to new space and the areas vacated are converted to nonlaboratory uses, benches and utilities must be torn out, floors resurfaced, and partitions and lighting changed.

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[a] Costing $25,000 or more and beyond ordinary building maintenance or deferred maintenance costing less than $25,000.

In estimating remodeling costs on a preliminary basis, the square footage of floor area to be remodeled serves as a good measuring unit. The cost per square foot may be assessed according to variable factors based upon the extent of remodeling required. Following is an illustration of potential remodeling costs.

Code 1 -	Minimum remodeling (painting, new lighting, new floor covering, minor partition changes)	$3.00 per s.f.
Code 2 -	Extensive remodeling (major partition changes, new floor covering, some utility rehabilitation, new lighting, painting)	$5.00 per s.f.
Code 3 -	Comprehensive renovation (extensive partition changes, interior structural improvements, complete utility overhaul, new lighting, new floors, painting)	$8.00 per s.f.

It should be noted that these unit costs are illustrative only; actual costs are to be determined from institutional experience in consultation with the State Planning Division staff.

C. New Buildings and Additions to Existing Structures

No attempt is made here to define the method to be used in estimating unit costs for various types of construction. The worksheets allow each institution to determine the method of estimating the costs of the facilities according to recent experience and professional advice from consulting architects or the staff of the State Planning Division.

Worksheets 21.2 or 21.2A may be used for estimating the costs of major new building projects enumerated in worksheet 19.7. The unit cost would be developed from the institution's recent experience adjusted by an escalation factor to bring these costs up-to-date.

It is recommended that cost estimates be expressed in terms of current dollar values. The estimates of future capital outlay requirements should not be adjusted to reflect anticipated changes in construction industry productivity or long-term inflationary forces. Local industry conditions (e.g., contractor bidding practices) are so significant in determining ultimate capital costs that adjustments in unit costs for national trends in inflation and productivity may introduce greater error than would otherwise be present in the estimates.

However, unit costs based upon past projects should be updated to reflect changing cost conditions. That this is necessary may be seen by reference to published construction cost indexes in various architectural and engineering journals. As an example, table 21.2 lists the F. W. Dodge Construction Cost Index for labor and materials in the Denver area for concrete and masonry type construction since 1955. Between 1955 and 1962, this index showed an increase of 20 percent, averaging an increase of 2.86 percent per year over seven years. In the four-year period, 1958-1962, the index rose by 10.8 percent, averaging an increase of 2.7 percentage points per year. This index may be used to estimate current construction costs by analyzing the actual cost of various types of buildings at an institution in recent years. Taking the basic contract cost (general, electrical, mechanical, special) per gross square foot of recent construction, the estimates may be adjusted at a 2.7 percent increase per year.

D. Land Acquisition, Utility Service, and Miscellaneous Other Capital Projects

The capital costs of land acquisition should be developed on worksheet 21.3. Acquisitions should be consistent with the schedule and needs suggested by the analysis in Chapter 20.

The capital costs of extension, enlargement, and rehabilitation of campus utility services which are not funded as part of major new building or major remodeling projects should be analyzed by the institution's staff in consultation, if necessary, with professional engineers and members of the State Planning Division staff. Under this heading would come additional boiler capacity (a completely new boiler plant would be considered a major building project), extension of utility tunnels and/or lines to areas of new development, sewer line extension costs, and major rehabilitation of utility lines. Capital projects of this kind should be enumerated in worksheet 21.4.

Worksheet 21.4 also should be used for listing of all other capital projects for which capital funds will be required: street, curb, and sidewalk development not funded as part of specific building projects; parking lot or structure development; landscape improvements; physical education and athletic field construction; and such other nonbuilding capital projects. In compiling these projects, refer to worksheets 20.5 and 20.6 for the compilation of requirements for physical education and athletic fields and to worksheet 20.8 for parking.

E. Source of Funds

The source of funding for the capital projects is, of course, significant in evaluating the feasibility of the development program and the appropriateness of reconsidering underlying policy planning assumptions. Worksheets 21.5 and 21.6 are to be used for analyzing each project in the sequence of campus development in regard to the source of funds; that is, whether federal government, state government, or some other source. Funding requirements are still expressed in terms of planning stages at this point, and all projects are included, whether state-funded or otherwise.

F. Summary of Capital Outlay Projections by Fiscal Year

Worksheet 21.7 provides for the compilation of all capital projects by fiscal year. It is on the same general format as State Form 1.2, the Moving Five-Year Projection Program, except that it extends through ten years. The number of years covered will depend upon how far the final planning stage used in the programming study will carry the institution. In some, the final stage may be reached by 1969, so that the span of funding shown would cover only through 1968-69. In other cases, the final stage may be reached after ten years; but there is no need to carry the funding summary beyond ten years at this time. This listing should include all projects not yet funded, regardless of source of funds.

Worksheet 21.8, which is derived from the preceding worksheet, is more analogous to State Form 1.2. The worksheet focuses on the requirements for state funds over the first five-year span. Under the fiscal year breakdown, only state funds should be shown.

In the future, projections should permit the development of capital funding estimates through at least eight years, even though the official capital budgets will probably continue to span five years; this will provide longer-term data for planning capital financing programs and provide a continuing base for the moving five-year estimates.

All parties should note that these long-range capital estimates are tentative and subject to revision from year-to-year as plans develop, estimating data improve, and priorities change.

TABLE 21.1; CAPITAL OUTLAY PROJECTIONS

Typical Schedule for Major Building Project

	Action	Timing	Fiscal Year	Months Elapsed
1.	Develop preliminary program and estimates.	Spring, 1964		1
2.	File Capital Construction Request for planning and design funds.	July 1, 1964		3
3.	Develop detailed architectural program requirements.	Fall, 1964		6
4.	Legislative appropriation, planning and design funds.[a]	Spring, 1965	(1965-66)	12
5.	Appoint architect, begin design studies.	Spring, 1965		13
6.	Preliminary cost estimates on construction.	May, 1965		14
7.	File Capital Construction Request for construction funds.	July 1, 1965		16
8.	Complete preliminary architectural plans.	October, 1965		20
9.	Start architectural working drawings.	November, 1965		21
10.	Legislative appropriation, construction funds.[a]	Spring, 1966	(1966-67)	25
11.	Submit to bid and start construction	Spring, 1966		26
12.	Detail equipment and furniture requirements.	Spring, 1966		27
13.	Submit Capital Construction Request for equipment and furniture funds.	July 1, 1966		28
14.	Legislative appropriation, equipment and furniture funds.[a]	Spring, 1967	(1967-68)	37
15.	Bids on furniture and equipment.	Summer, 1967		40
16.	Complete construction.	Fall, 1967		44
17.	Occupy building.	Winter, 1968		46

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[a] Assumed; otherwise, remainder of schedule deferred at least one year.

TABLE 21.2; CAPITAL OUTLAY PROJECTIONS

F. W. Dodge Construction Cost Index
Labor and Materials, Brick and Concrete Commercial and Factor Buildings
Denver Area[a]

Year	Index (1926-29 = 100)	Percent Increase over 1955	Percent Increase over 1958
1955	273.2	--	--
1956	282.3	3.3	--
1957	293.1	7.3	--
1958	295.9	8.3	--
1959	302.9	10.9	2.4
1960	309.0	13.1	4.4
1961	316.1	15.7	6.8
1962 (6/1)	327.9	20.0	10.8
Average percent increase per year		2.86%	2.70%

---

[a] Source: Architectural Record, Western Edition, October, 1962, p. 32-12

WORKSHEET 21.1; CAPITAL OUTLAY PROJECTIONS

Capital Outlay Requirements for Demolition and Major Remodeling Projects

Institution ______________________________

							Aggregate Capital Outlays		
	Building 1	Planning Stage 2	Budget Category 3	Project Code 4	Size of Project: Gross Square Feet 5	Unit Cost per Square Foot[a,b] 6	Basic Project[a,b] 7	Additional Costs (percent of basic project)[c] 8	Completed Project[a,d] 9
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
⋮									
n									

(Continued)

WORKSHEET 21.1 (Continued)

DATA SOURCES:

Col. 1: Worksheet 19.6
Col. 2: Worksheet 19.6
Col. 3: Worksheet 19.6
Col. 4: Planning analyst
Col. 5: Worksheet 19.6
Col. 6: Planning analyst
Col. 7: Col. 5 x Col. 6
Col. 8: Planning analyst
Col. 9: (Col. 7) x (Col. 8 ÷ 100)

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] Expressed in current year dollar values. Specify year.

[b] Covers construction costs only; i.e., excluding professional fees and contingency items.

[c] Covers additional charges for professional fees and contingency items.

[d] Covers all project costs except movable equipment and furniture.

WORKSHEET 21.2; CAPITAL OUTLAY PROJECTIONS

Capital Outlay Requirements for New Buildings and Additions to Existing Structures

Institution ______________________________

						Aggregate Capital Outlays		
	Building 1	Planning Stage 2	Budget Category 3	Size of Project: Gross Square Feet 4	Unit Cost per Square Foot[a,b] 5	Basic Project[a,b] 6	Additional Costs (percent of basic project)[c] 7	Completed Project[a,d] 8
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
.								
.								
.								
n								

(Continued)

WORKSHEET 21.2 (Continued)

DATA SOURCES:

Col. 1: Worksheet 19.7
Col. 2: Worksheet 19.7
Col. 3: Worksheet 19.7
Col. 4: Worksheet 19.7
Col. 5: Planning analyst
Col. 6: Col. 4 x Col. 5
Col. 7: Planning analyst
Col. 8: (Col. 6) x (Col. 7 + 100)

PREPARED:

By____________________

Date____________________

APPROVED:

By____________________

Date____________________

SUBMITTED:

By____________________

Date____________________

TECHNICAL NOTES:

[a] Expressed in current year dollar values. Specify year.

[b] Covers construction costs only; i.e., excluding professional fees and contingency items.

[c] Covers additional charges for professional fees and contingency items.

[d] Covers all project costs except movable equipment and furniture.

WORKSHEET 21.2A; CAPITAL OUTLAY PROJECTIONS

Alternate Worksheet for Estimating Capital Outlay Requirements for New Buildings and Additions to Existing Structures

Institution__________________ Project Designation________________
Budget Category_______________ Type Structure____________________
General Functions____________________________
Assignable Square Feet___________ Gross Square Feet________________

	Project Cost Component 1	Number of Units[a] 2	Unit Cost[b] 3	Total Capital Outlay[b] 4
1	Construction:			
2	General			
3	Mechanical			
4	Electrical			
5	Special			
6	Subtotal: basic contracts			
7	Utility extensions			
8	Site development			
9	Roads, walks, parking			
10	Site lighting			
11	Landscaping			
12	Subtotal: utilities and site work			
13	Subtotal: construction			
14	Professional fees:			
15	Preliminary planning			
16	Surveys, tests, site plan			

(Continued)

WORKSHEET 21.2A (Continued)

	Project Cost Component 1	Number of Units[a] 2	Unit Cost[b] 3	Total Capital Outlay[b] 4
17	Architects and engineers			
18	Consultants			
19	Supervision			
20	Subtotal: professional fees			
21	Project contingency			
22	Land acquisition			
23	Total: construction, professional fees, contingency and land acquisition			
24	Movable furniture and equipment			
25	Grand total			

DATA SOURCES:

Col. 1: Planning assumption
Col. 2: Worksheet 19.7 or planning analyst
Col. 3: Planning analyst
Col. 4: Col. 2 x Col. 3

PREPARED:
By____________
Date____________

APPROVED:
By____________
Date____________

SUBMITTED:
By____________
Date____________

TECHNICAL NOTES:

[a] Gross square feet, usually.

[b] Expressed in current year dollar values. Specify year.

WORKSHEET 21.3; CAPITAL OUTLAY PROJECTIONS

Capital Outlay Requirements for Land Acquisition

Institution______________________

	Acquisition 1	Planning Stage 2	Size of Acquisition[a] 3	Unit Cost[b] 4	Total Capital Outlay[b] 5
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

DATA SOURCES:

Col. 1: Worksheet 20.9
Col. 2: Worksheet 20.9
Col. 3: Worksheet 20.9
Col. 4: Planning analyst
Col. 5: Col. 3 x Col. 4

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] Indicate unit reference base used in calculations; i.e., acres, etc.

[b] Expressed in current year dollar values. Specify year.

WORKSHEET 21.4; CAPITAL OUTLAY PROJECTIONS

Capital Outlay Requirements for Utility Service and Miscellaneous Other Capital Projects

Institution______________________...

	Type of Work[a] 1	Planning Stage 2	Size of Project[a] 3	Unit Cost[b,c] 4	Total Capital Outlay[b,c] 5
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

DATA SOURCES:

Col. 1: Planning analyst
Col. 2: Planning analyst
Col. 3: Planning analyst
Col. 4: Planning analyst
Col. 5: Col. 3 x Col. 4

PREPARED:
By__________________
Date__________________

APPROVED:
By__________________
Date__________________

SUBMITTED:
By__________________
Date__________________

TECHNICAL NOTES:

[a] Indicate unit reference base used in calculations of costs of individual projects; i.e., cubic yards of fill, linear feet of 6" pipe, etc.

[b] Expressed in current year dollar values. Specify year.

[c] Should cover all project costs, including such components as professional fees and contingencies.

WORKSHEET 21.5; CAPITAL OUTLAY PROJECTIONS

Master Schedule for Campus Development Program; Priority Phasing and Capital Costs for Demolition, Major Remodeling Projects, New Buildings and Additions to Existing Structures, Land Acquisition, and Utility Service and Miscellaneous Other Capital Projects, by Source of Funds

Institution________________________

	Project 1	Planning Stage 2	Project Number 3	Aggregate Capital Outlays[a] 4	Source of Funds[b]		
					State Government 5	Federal Government 6	Other[c] 7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
.							
.							
.							
n	Total						

DATA SOURCES:

Col. 1: Worksheet 21.1, Col. 1; worksheet 21.2, Col. 1; worksheet 21.3, Col. 1; worksheet 21.4, Col. 1
Col. 2: Worksheet 21.1, Col. 2; worksheet 21.2, Col. 2; worksheet 21.3, Col. 2; worksheet 21.4, Col. 2
Col. 3: Planning analyst. Projects can be numbered in numerical sequence.
Col. 4: Worksheet 21.1, Col. 9; worksheet 21.2, Col. 8; worksheet 21.3 Col. 5; worksheet 21.4, Col. 5
Col. 5: Planning analyst
Col. 6: Planning analyst
Col. 7: Planning analyst

(Continued)

WORKSHEET 21.5 (Continued)

PREPARED:	APPROVED:	SUBMITTED:
By________________	By________________	By________________
Date________________	Date________________	Date________________

TECHNICAL NOTES:

[a] Planning analyst should make certain that all dollar figures are expressed in the same (current year) dollar values.

[b] For each project the sum of the entries should equal the total project cost listed in Col. 4.

[c] Specify source.

WORKSHEET 21.6; CAPITAL OUTLAY PROJECTIONS

Summary of Master Schedule for Campus Development Program;
Capital Costs for Demolition, Major Remodeling Projects,
New Buildings and Additions to Existing Structures,
Land Acquisition, and Utility Service and
Miscellaneous Other Capital Projects, by
Source of Funds and Planning Stage[a]

Institution________________________

		Planning Stage					
	Source of Funds	I	II	III	IV	V	VI
	1	2	3	4	5	6	7
1	State government						
2	Federal government						
3	Other[b]						
4	Total capital outlays:						
5	Each stage						
6	Cumulative total						

DATA SOURCES:

Line 1: Worksheet 21.5
Line 2: Worksheet 21.5
Line 3: Worksheet 21.5
Line 4: No entry
Line 5: Sum of lines 1, 2 and 3
Line 6: Planning analyst, using entries on line 5

PREPARED:	APPROVED:	SUBMITTED:
By__________	By__________	By__________
Date__________	Date__________	Date__________

TECHNICAL NOTES:

[a] All figures are expressed in current year dollar values.

[b] Specify source.

WORKSHEET 21.7; CAPITAL OUTLAY PROJECTIONS

Conversion of Master Schedule for Campus Development Program from Planning Stage Reference Base to Fiscal Year Reference Base, by Project, Expenditure Objective and Source of Funds[a]

Institution________________________

	Project Number	Project and Expenditure Objective	Source of Funds		
			State Government	Federal Government	Other[b]
	1	2	3	4	5
1		Project title[c]			
2		Planning and design			
3		Construction			
4		Equipment			
5		Project title[c]			
6		Planning and design			
7		Construction			
8		Equipment			
.					
.					
.					
n					

DATA SOURCES:

Col. 1: Worksheet 21.5
Col. 2: Worksheet 21.5
Col. 3: Worksheet 21.5
Col. 4: Worksheet 21.5
Col. 5: Worksheet 21.5
Col. 6: Worksheet 21.5 and planning analyst
Col. 7: Worksheet 21.5 and planning analyst
Col. 8: Worksheet 21.5 and planning analyst
Col. 9: Worksheet 21.5 and planning analyst
Col. 10: Worksheet 21.5 and planning analyst
Col. 11: Worksheet 21.5 and planning analyst
Col. 12: Worksheet 21.5 and planning analyst
Col. 13: Worksheet 21.5 and planning analyst
Col. 14: Worksheet 21.5 and planning analyst
Col. 15: Worksheet 21.5 and planning analyst

(Continued)

WORKSHEET 21.7 (Continued)

Fiscal Year									
1964-5	1965-6	1966-7	1967-8	1968-9	1969-70	1970-1	1971-2	1972-3	1973-4
			(Approximate Planning Stage)[d]						
6	7	8	9	10	11	12	13	14	15

PREPARED:
By____________________
Date____________________

APPROVED:
By____________________
Date____________________

SUBMITTED:
By____________________
Date____________________

TECHNICAL NOTES:

[a] All figures are expressed in current year dollar values.

[b] Specify source.

[c] Specify project title.

[d] Specify stage.

WORKSHEET 21.8; CAPITAL OUTLAY PROJECTIONS

Master Schedule for Campus Development Program; Moving Five-Year Projection of Capital Outlay Requirements for All Capital Projects Requiring State Government Funding, by Project, Expenditure Objectives and Fiscal Year[a]

Institution________________________

	Project Number 1	Project and Expenditure Objective 2	Fiscal Year					
			1964-5 3	1965-6 4	1966-7 5	1967-8 6	1968-9 7	Total, 1964-5 to 1968-9 8
1		Project title						
2		Planning and design						
3		Construction						
4		Equipment						
5		Project title						
6		Planning and design						
7		Construction						
8		Equipment						
.								
.								
.								
n		Total						

DATA SOURCES:

All data are from worksheet 21.7. Column 8 is equal to the sum of columns 3, 4, 5, 6, and 7.

PREPARED:	APPROVED:	SUBMITTED:
By	By	By
Date	Date	Date

TECHNICAL NOTES:

[a] All figures are expressed in current year dollar values.

APPENDIX A

CHECK LIST OF SELECTED QUESTIONS ON INSTITUTIONAL POLICIES AND PLANS RELATING TO CAMPUS DEVELOPMENT PROGRAMMING

1. Enrollment and Planning Stages

    1. What are your estimates of total full-time equivalent and head count enrollments at your institution during the coming decade?

    2. What series of planning stages should this ten year period be divided into?

    3. What changes do you expect in the distribution of FTE and head count enrollments among the various levels of instruction (lower division, upper division, and graduate) over the planning period?

    4. What changes are expected in the distribution of enrollments by sex, marital status, and residential status?

2. Instructional Workloads: Programs and Subject Fields

    1. What degree programs or fields of study do you expect to add or abandon over the series of planning stages?

    2. Will new programs of study require any special facilities?

    3. Do you anticipate any changes in the number of semester hours of different courses to be offered per 100 FTE students?

    4. Are new joint programs of study among departments, divisions, and institutions being planned? If so, how will these affect instructional loads?

3. Instructional Workloads: Types of Facilities

    1. What modifications are expected in the number and mix of instructional hours among lectures, seminars, laboratory and other types of meetings in the various fields of study offered at your institution?

    2. What are the preferred class group meeting sizes for the various types of subjects and levels of instruction in classroom, laboratory, seminar, studio, and other types of facilities?

    3. What changes may be expected in methods of instruction?

4. Staff Requirements

    1. What planning criterion should be used as the typical faculty load, expressed in contact hours per week or semester, in the various fields and levels of instruction?

    2. To what extent will graduate assistants and undergraduate student help be used in instruction?

3. What planning basis is used at your institution to provide clerical, secretarial, and technical staff in instructional departments?

4. What is the extent and character of the growth expected in administrative, physical plant, student personnel, library, food service, housekeeping, and other non-teaching personnel?

5. Classroom Space

1. What is the present number and size-distribution of classroom-type facilities at your institution?

2. What is the present level of room and student station utilization at your institution?

3. What specific scheduling problems at your institution may lead to difficulties in realizing the utilization standards recommended in the 1959-60 Baxter study? What modifications will be necessary to overcome such difficulties?

4. Are existing classrooms characterized by any physical limitations which impose restrictions on their utilization at higher rates? What modifications are required to overcome such limitations?

5. What modifications do you expect in the equipment used for student stations in classroom and seminar rooms (e.g., use of tables instead of tablet-armchairs)?

6. What trends are expected in the distribution of class sizes in classroom-type instruction? Do you expect to increase the use of large lecture sections and/or small independent study groups?

6. Special Purpose Instructional Space

1. What is the present number and size distribution of teaching laboratories and other special purpose instructional facilities at your institution?

2. What new types of teaching laboratories may be needed in the next decade?

3. What are the present levels of utilization in the various types of teaching laboratories and other special purpose instructional space?

4. Do you anticipate difficulties in achieving the laboratory utilization standards proposed in the Baxter study? Are these due to scheduling problems, small course enrollments, or other factors?

5. What changes are expected in the nature of instruction in the various special purpose facilities? Will these affect station area requirements?

7. Office Space

   1. What policies will be followed with regard to providing offices for faculty? Other professional personnel? Supporting technicians? Supporting clerical and secretarial? What proportions of each category will be assigned single or multiple occupancy office space?

   2. Will desk space be provided for all graduate assistants? Should desk space for graduate assistants be provided in bull-pen type offices?

   3. What types of desk or study space will be provided for non-teaching graduate students?

8. Research Space

   1. What types of organized research (if any) will be conducted at your institution?

   2. Do you anticipate any increase in the amount of student research activity required as part of the undergraduate programs of study?

   3. What changes are expected in the organization of research programs insofar as the use of regularly budgeted university personnel?

   4. To what extent will future research programs require an expansion in the number of persons employed and reimbursed under separately budgeted research funds?

   5. Do you anticipate the establishment at your institution of any separately identifiable institutes devoted solely to research activity? Please describe for each planning stage.

   6. For non-laboratory oriented departments, what research facilities other than private office and library space are required for the accommodation of staff research activities?

   7. What proportion of the FTE faculty presently engaged in research activity require office or library space?

   8. What proportion of the FTE faculty presently engaged in research activity require laboratory type space?

   9. What changes do you anticipate in the volume and departmental distribution of research activity at each planning stage?

   10. What departments are not presently engaged in research activity but expect to do so in the future?

   11. What is the present policy concerning the provision of space for the conduct of research activities unrelated to graduate study programs?

12. What is the policy of your institution concerning the establishment of research facilities for organizations or institutes that are not affiliated or only indirectly affiliated with your institution?

13. Is research space, laboratory or library, now provided on a uniform basis for all graduate students? Honors students? At each planning stage?

14. What is the present policy of your institution with regard to centralized or interdepartmental use of various types of research laboratory service facilities: e.g., storage? photography facilities? preparation areas? glasswashing facilities? constant temperature facilities? animal rooms? computer facilities? other? What modifications should be planned for each planning stage?

15. How will community service and/or academic extension programs change in relative importance over the course of the planning period?

16. What departments at your institution have organized community service and/or extension programs at present?

17. What other departments will add such programs over the course of the planning period?

9. Library and Other Instructional Service Space

A. Organization

1. What is the policy of your institution with regard to centralized branch libraries?

2. What collections (by subject matter) will be housed outside the main library at each planning stage?

3. For each separate installation, how many volumes will be involved at each planning stage?

4. What will be the hours of operation in the main library and in branch libraries at each planning stage?

B. Book Stock

1. How many volumes does the library presently have in its various collections? If you maintain branch libraries, what is the present size of the book stock at each installation?

2. How many periodicals does the library presently subscribe to on a regular basis? Has the number of subscriptions increased in recent years? If so, in what way? How many titles and issues per title are normally kept on open shelves at one time?

3. How many volumes are anticipated in the library book stock (at each installation) at each planning stage?

4. For each installation, what proportion of the present library collection is housed in open stacks? In closed stacks?

5. In the future, will the library be organized on (a) an open stack system? (b) a closed stack system with library personnel providing requested volumes? or (c) some combination of the preceding alternatives? Consider for each planning stage and each library installation.

6. Are any technical changes anticipated in the means of storing library material, such as microfilming older periodicals or volumes infrequently called for? What proportion of the collection is involved? Consider for each planning stage.

C. Reading Rooms

1. What proportion of the student body can presently be seated in the library reading rooms?

2. What proportion of the student body should be provided with seating at each planning stage?

3. For each planning stage, what is the preferred distribution of reader stations among the following categories: general reading rooms, carrels, periodical reading rooms, reference reading rooms, special reading rooms?

4. What proportion of present reader stations are occupied at peak period during the day? During the week? During the term?

5. What special reading rooms are required, such as microfilm reading rooms, rare book rooms, map rooms, bibliography rooms, etc.? Consider for each planning stage.

D. Staff

1. Will branch libraries be staffed with professional personnel?

2. To what extent will student workers in the library be used?

E. Service Elements

1. What is the ratio of books on reserve to basic book stock at each library installation? Please indicate the ratio appropriate to each planning stage.

2. Will technical services (cataloguing, processing, accessions, purchasing, binding) all be conducted in the main library? If not, to what extent will these activities be dispersed among the branch libraries?

3. Should space for photostating, photocopying or any other duplicating process for students be provided? What kinds of equipment are involved?

4. Are any special meeting rooms required, such as seminar rooms or lecture theaters? In the event that such rooms are provided, can they be assumed to be part of the over-all complex of scheduled space?

5. Are any special faculty research rooms required as part of the library accommodation of research activity? If so, how many at each planning stage?

6. How many typing stations should be provided for students at each planning stage?

7. Is a special room required for the display of library exhibits? Should such exhibits be housed in display cases in a public lobby area?

8.. Are any other special areas required? Please specify.

10. Museum and Gallery Space

1. What provision should be made for organized museum and/or gallery displays?

2. Are these facilities to be developed independent of departmental affiliation or as adjuncts to departmental instructional and/or research programs?

11. Athletic Activities Space

1. Please describe the present scope and character of indoor athletic facilities at your institution.

2. What are the physical education requirements for male and female students at your institution at present? Can we assume that no changes will occur in these requirements? If not, please indicate the modifications anticipated for each planning stage.

3. What is the present scope, character and extent of participation of students in intramural athletic programs at your institution? If changes are expected, please describe them for each planning stage.

4. What is the present scope and character of the intercollegiate athletic program at your institution? Please describe the changes you expect to occur at each planning stage; e.g., (number of teams, size of teams, number of competitions engaged in by each team, etc.).

5. What proportion of the staff and student populations should be provided seating space in the various spectator-type athletic facilities? What amounts of seating for public sale should be provided?

12. Housing Space

1. What is the present capacity of dormitory facilities on campus?

2. What proportion of FTE enrollment is presently housed in dormitory facilities on campus?

3. What proportion should be housed on campus at present?

4. What proportion of FTE enrollment should be housed on campus at each planning stage?

5. Is it the policy of your institution to provide single occupancy dormitory rooms for all students? Double occupancy rooms for all students? Some combination of single and double occupancy?

6. Are these proportions the same for both male and female residential facilities?

7. Will the present distributional pattern between single and double occupancy dormitory rooms continue at future enrollment levels? If not, please indicate the appropriate distributional ratios for each planning stage.

8. Do dormitory students presently dine separately from commuting students? What modifications should be planned in the separation of dormitory students and commuting students in dining hall facilities at each planning stage?

9. Are dormitory or residential facilities provided for married students and/or staff at present?

10. What changes should be planned in the number and/or proportion of married students and staff that will be housed in facilities operated by your institution at each planning stage?

13. Food Service Space

1. What is the present capacity of food service facilities: dining halls? food preparation and storage areas? service areas? What should capacity be at each planning stage?

2. Are present dining facilities designed to accommodate hot meal service three times per day? Hot meal service at lunch hour only? Snack bar service only? Some combination of these?

3. What is the prevailing turnover factor in dining hall stations at each meal? i.e., one sitting? two sittings? higher?

4. Do present dining hall schedules interfere with use of the noon hour for the scheduling of instructional space? Will this condition be modified in the future? At which planning stage?

14. Staff and Student Service Space

1. Does your institution presently have student center facilities? If not, at what planning stages should such facilities be provided?

2. What kinds of facilities should be incorporated within the student center complex: for example, student lounges? music rooms? bowling facilities? cafeteria facilities? billiards? table tennis? meeting rooms? chapel facilities? arts and crafts facilities? theatre facilities? bookstore? laundry and tailoring facilities? student post office? other?

3. Is there presently a faculty club on campus? If not, at what planning stage should such a facility be programmed?

4. What elements should be included in the faculty club facilities: dining facilities? lounge facilities? music rooms? billiards? table tennis? meeting rooms? reading rooms? other?

5. Is there at present an adequate number of common rooms for male and female staff members distributed among the various buildings of the college?

6. What is the present policy with respect to the provision of kitchenette facilities in staff and lounge areas?

7. How many clubs or student organizations are presently active on campus? How many organizations do you expect will be active at each planning stage?

8. What is the policy of the college with respect to the provision of locker facilities for students and for staff?

9. Are mail box facilities provided for all staff? All students? Some proportion of each of these groups?

15. Miscellaneous Other Space

1. Are present first aid and infirmary facilities adequate? What is

the capacity of the existing infirmary (number of beds)? What capacity is deemed necessary at each enrollment stage?

2. What facilities at your institution are devoted primarily to community service and/or extension activities?

3. Will any special facilities be required for the community service and extension programs of the future as presently conceived?

4. How frequently do outside groups use the institution's facilities in connection with the community service and extension programs?

16. Physical Plant Maintenance and Operations

1. Is the present boiler plant and utilities network at your institution adequate in capacity to your present operating requirements?

2. In what way will the increased demand for utility services at each planning stage require modification in the character of your present system: e.g., with regard to capacity? purchase or generation of power? modifications of distributional network? other?

3. Is the present capacity of warehousing and storage facilities at your institution adequate relative to present operating levels?

4. Is it the policy of the institution to maintain central warehousing and stockroom facilities with purchasing through a central administrative office?

5. Will central purchasing, warehousing and supply systems become standard policy at your institution? At which planning stage?

6. Is present capacity in maintenance shops and garages adequate to current needs?

7. Are maintenance shops presently housed in structures that are separate from campus buildings devoted to instruction, research, staff and student service, and administration?

8. What modifications should be planned in the number, size and character of the maintenance shops and vehicles used at your institution at each planning stage?

9. Are facilities for merchandising commodities produced as by-products in normal institutional activities adequate relative to present operating requirements? (meats, milk, etc.). What modifications will be required at each planning stage?

17. Physical Plant Inventory

1. Please provide a list of the present buildings in use on your campus,

with an indication of the gross and net areas of the buildings and the principal use made of each structure.

2. Please provide a list of all buildings presently under construction in your campus, with an indication of the gross and net areas of the building and the principal use to be made of the structure.

3. Please provide a list of all buildings presently in the architectural design and/or drawing stage, with an indication of the gross and net areas of the buildings and the principal functions for which the buildings will be used.

4. Please provide a tabulation of assignable space in these buildings, cross-classified by departmental assignment and function.

18. Building Occupancy Patterns

1. What functional groupings of departments and divisions do you consider desirable at your institution?

2. Is the present building occupancy pattern at your institution satisfactory in the sense of grouping departments and functional activities that are similar or related in nature?

3. What modifications in present building occupancy patterns should be adopted for each planning stage?

4. Will the functional organization of departments and activities continue and/or be implemented as a general policy in all future construction and building occupancy decisions (functional distribution and grouping of departments and division)?

5. Will the space programs for various departments, divisions and activities be satisfied by housing them in buildings in such a way as to approach the ideal occupancy pattern? At each planning stage?

19. Building Program

1. After comparing physical plant available and projected space requirements, what is the size of the deficit in existing plant at each planning stage?

2. Please indicate those structures on your campus that are considered temporary in nature, the priority to be attached to the demolition of temporary and/or antiquated structures, and the planning stage at which such demolition will occur.

3. What new structures are required at your institution? What is the proposed size and character of occupancy of the proposed construction?

4. What priorities do you attach to the timing of new construction? In what order are the new buildings to be developed? At which planning stage is each element of new construction to be available for use?

5. With regard to renovation of permanent structures, please indicate the buildings that require renovation, the priorities attached to the renovation programs, and the planning stage at which renovation will occur.

20. Land Requirements and Campus Organization

1. Is the present campus adequate to meet the building and open space requirements of your institution at present? At each planning stage?

2. Please describe the scope and character of present outdoor athletic facilities at your institution. What will be the impact of changes in the level and character of activity in outdoor physical education, intramural and intercollegiate athletic programs upon land requirements?

3. Are present arrangements with regard to pedestrian and vehicular circulation satisfactory? If unsatisfactory, please indicate the modifications you deem necessary to bring the campus circulation system to a satisfactory condition at each planning stage.

4. What is the present policy with regard to student operation of automobiles on campus? Can we assume continuation of this policy? If not, what changes in policy will occur at each planning stage?

5. What is the present capacity of parking facilities on campus? Are they adequate relative to the capacity requirements indicated by the present operating loads of your institution? What modifications in parking regulations and capacity will occur at each planning stage?

6. Is there presently, or do you anticipate the adoption of, a campus master plan under which buildings and activities will be grouped according to function? Can we assume this arrangement will continue to prevail at each planning stage? If not, please describe the manner and planning stage at which changes in any of the above elements of campus organization will affect the requirements of various departments and divisions for space.

21. Capital Outlay

1. To what extent will implementation of the campus development program be funded by a) federal funds? b) state funds? c) private funds and gifts? d) other?

2. Are any revisions required in institutional planning assumptions in light of the availability of capital funds to implement the campus development program?

APPENDIX B

ENUMERATION OF RECOMMENDED SUBJECT FIELD CATEGORIES AND CODES OF INSTRUCTIONAL AND RESEARCH UNITS FOR USE IN PHYSICAL PLANT PROGRAMMING STUDIES

GENERAL CATEGORIES TO BE USED BY ALL INSTITUTIONS

Code	Category
1100	Agricultural Sciences
1200	Biological Sciences
1300	Mathematics
1400	Physical Sciences
1500	Engineering Sciences
1600	Social Sciences, Non-Laboratory
1700	Social Sciences, Laboratory
1800	Arts and Crafts
1900	Languages and Literature
2000	Professions and Other
2100	Business
2200	Education
2300	Home Economics
2400	Law
2500	Journalism
2600	Health Professions
2700	Physical Education
2800	R.O.T.C.
2900	Other

SUGGESTED CODING OF SPECIFIC SUBJECT FIELDS
WITHIN GENERAL CATEGORIES

Code	Category and Subject Fields
1100	Agricultural Sciences
1101	Agronomy
1102	Animal Husbandry
1103	Dairy Husbandry
1104	Dairy Manufacturing
1105	Farm Management
1106	Horticulture
1107	Ornamental Horticulture
1108	Poultry Husbandry
1109	Other
1111	Forestry and Range Management
1112	Watershed Management

Code	Category and Subject Fields
1200	**Biological Sciences**
1201	Biological Science
1202	Biology, General
1203	Botany
1204	Zoology
1205	Anatomy and Histology
1206	Bacteriology
1207	Biochemistry
1208	Biophysics
1209	Entomology
1211	Genetics
1212	Pathology
1213	Plant Pathology
1214	Physiology
1215	Microbiology
1300	**Mathematical Sciences**
1301	Applied Mathematics
1302	Computer Science
1303	Mathematics
1304	Statistics
1400	**Physical Sciences**
1401	Physical Science, General
1402	Astrophysics
1403	Astrogeophysics
1404	Atmospheric Science
1405	Chemistry
1406	Geology
1407	Physics
1408	Engineering Physics
1409	Other
1500	**Engineering Sciences**
1501	Aeronautical
1502	Agricultural
1503	Architectural
1504	Chemical
1505	Civil
1506	Electrical

Code	Category and Subject Fields
1500	Engineering Sciences (continued)
1507	Geological
1508	Geophysical
1509	Mechanical
1510	Metallurgical
1511	Mining
1512	Petroleum
1513	Petroleum Refining
1514	General, Engineering Science
1515	Industrial
1600	Social Sciences: Non-Laboratory
1601	Social Sciences, General
1602	Economics
1603	Government - Political Science
1604	History
1605	Public Administration
1606	Personnel Service
1607	Labor Relations - Industrial Relations
1608	Regional-Area Studies
1609	International Relations
1700	Social Sciences: Laboratory
1701	Anthropology - Archaeology
1702	Geography
1703	Psychology
1704	Sociology
1705	Behavioral Science
1706	Library Science and Bibliography
1800	Arts and Crafts
1801	Architecture
1802	Fine Arts
1803	Commercial Arts
1804	Industrial Arts and Crafts
1805	Landscape Architecture
1806	Music
1807	Planning
1808	Engineering Drawing, Graphics, Design

Code	Category and Subject Fields
1900	Languages and Literature
1901	Humanities, General
1902	English Language and Literature
1903	Classical Languages and Literature
1904	Philosophy
1905	Honors
1906	Speech and Drama
1907	Technical; e.g., English in Engineering
(1910)	Modern Foreign Languages and Literature
1911	French
1912	German
1913	Italian
1914	Russian and Other Slavic
1915	Oriental and Eastern
1916	Spanish, Portuguese
1918	Comparative Literature and Modern Languages
2000	Professions and Other
2100	Business - General
2101	Accounting
2102	Administration
2103	Commercial Practice, Secretarial
2104	Communications
2105	Finance
2106	Management
2107	Marketing
2108	Real Estate
2109	Other
2200	Education
2201	Elementary
2202	Secondary
2203	Administration
2204	Special
2205	Vocational

Code	Category and Subject Fields
2300	Home Economics
2301	General Home Economics
2302	Family and Child Development
2303	Clothing and Textiles
2304	Foods and Nutrition
2400	Law
2500	Journalism
2501	Advertising
2502	News and Editorial
2503	Technical
2600	Health Professions
2601	Dentistry
2602	Medicine
2603	Nursing
2604	Pharmacy
2605	Veterinary Medicine
2606	Medical Technology
2607	Occupational, Physical, Speech Therapy
2608	Pre-Medicine, Pre-Dentistry, Pre-Nursing
2700	Physical Education
2701	Physical Activities (required)
2702	Physical Education - Men (degree program)
2703	Physical Education - Women (degree program)
2800	R.O.T.C.
2801	Air Science
2802	Military Science
2803	Naval Science
2900	Other Programs

APPENDIX C

CLASSIFICATION OF SELECTED POSITION TITLES FOR USE IN INSTITUTIONAL STAFF CENSUSES AND PROJECTIONS

1. FACULTY AND OTHER PROFESSIONAL

1.1 EXECUTIVE

President
Vice President
Provost
Dean

Director
Associate dean
Assistant dean
Chairman, head

1.2 FACULTY

Professor emeritus
Professor
Associate professor
Assistant professor
Instructor

Professor Adjunct
Special instructor
Technical instructor
Lecturer
Fellow

1.3 ASSISTANTS

Teaching associate
Graduate assistant
Teaching assistant

Visiting fellow
Visiting lecturer
Visiting research fellow

1.4 OTHER PROFESSIONAL

Accountant
Actuary
Administrator
Advisor
Aeronautical engineer

Agronomist
Anthropologist
Archaeologist
Architect
Archivist

Assistant ________________
Associate ________________
Astronomer
Audio-visual educational specialist
Audio-visual specialist

Auditor
Bacteriologist
Biochemist
Biologist
Bookstore manager

Botanist
Budget analyst
Bursar
Business manager
Cafeteria manager

Chemical engineer
Chemist
Civil engineer
Coach (athletics)
Computer programmer

1.4 OTHER PROFESSIONAL (continued)

Consultant
Controller
Coordinator
Counselor
Curator

Dentist
Director
Economist
Editor
Electrical engineer

Engineer
Entomologist
Executive assistant
Executive director
Extension associate

Extension home economist
Extension specialist
Extension teaching specialist
Extension TV specialist
Field veterinarian

Food service supervisor
Geneticist
Geographer
Geologist
Historian

Home economist
Information specialist
Instruction materials specialist
Laboratory director
Land agent

Librarian
Manager
Mathematician
Mechanical engineer
Medical interne

Meteorologist
Microbiologist
Mining engineer
Moderator
Nutritionist

Ophthalmologist
Pathologist
Petroleum engineer
Pharmacist
Physician

Physicist
Physiologist
Placement counselor
Planning officer
Political scientist

Procurement officer
Program assistant
Program director
Program manager
Psychiatrist

Psychologist
Psychometrist
Purchasing agent
Radiobiologist
Radio-television producer-writer

Regional coordinator
Registrar
Research associate
Research scientist
Research specialist

Research visitor
Scientist
Security analyst
Sociologist
Special projects officer

State leader
Statistician
Structural engineer
Superintendent
Supervisor

Surgeon
Surgical interne
Systems development specialist
Technical reports editor
Training specialist

1.4 OTHER PROFESSIONAL (continued)

Translator
Treasurer

Veterinarian
Vocational teacher trainer
Zoologist

2. SUPPORTING TECHNICAL AND TRADES

Animal caretaker
Animal technician
Assistant ______________
Baker
Beef cattle manager

Bindery employee
Biologist aide
Bookbinder
Building maintenance engineer
Building maintenance supervisor

Building services supervisor
Building utility operator
Butcher
Cabinet maker
Carpenter

Chef
Chemical analyst
Chief engineer (stationary), boiler room
Chief fire control technician
Chief gunner's mate

Construction machinery operator
Cook
Counterman
Data analyst
Dairy cattle superintendent

Dairy product sampler
Dog farm superintendent
Draftsman
Electrician
Experimentalist

Experimental animal caretaker
Farm manager
Field assistant
Field enumerator
Fireman, boiler room

Food preparation worker
Foreman
Fruit technician
Gardens superintendent
General mechanic

Glassblower
Greenhouse superintendent
Guard captain
Gunnery sergeant
Housing inspector

IBM supervisor
Illustrator
Laboratory assistant
Laboratory mechanic
Laboratory research assistant

Laboratory machinist
Laboratory services supervisor
Laboratory stores assistant
Laboratory technician
Linotype operator

Lithograph platemaker
Livestock superintendent
Locksmith
Machinist
Maintenance engineer

2. SUPPORTING TECHNICAL AND TRADES (continued)

Maintenance mechanic
Machinist printer
Mason
Meat cutter
Medical illustrator

Medical technologist
Milk plant supervisor
Nurse
Nursery manager
Nurse's aide

Off-set pressman
Orchard manager
Painter
Pantry man
Photographer

Photographic duplication supervisor
Photostat operator
Physical science aide
Pilot plant supervisor
Plant maintenance mechanic

Plumber
Power plant engineer
Pressman
Production associate
Printer

Refrigeration mechanic
Research animal manager
Research assistant
Research technician
Science illustrator

Scientific instrument maker
Seed technician
Sheep farm manager
Shipping supervisor
Soil technician

Station engineer
Steam fireman
Steamfitter
Steward
Supervisor (of laborers)

Surgical attendant
Swine farm manager
Tailor
Technician
Technical staff assistant

Temperature control mechanic, refrigeration
Traffic and security officer
Trainer
Utilities station operator
Visual aids operator

Visual aids technician
Welder
X-ray technician

3. SUPPORTING CLERICAL

Accounting clerk
Administrative aide
Administrative assistant
Administrative business officer
Administrative clerk

Administrative NCO
Administrative secretary
Assistant ______________
Audit clerk
Bookkeeper

3. SUPPORTING CLERICAL (continued)

Bookkeeping machine operator
Cashier
Cataloguer
Chief clerk
Chief storekeeper

Chief telephone operator
Chief quartermaster
Chief yeoman
Clerical assistant
Clerk

Clerk cashier
Clerk-typist
Coder
Computer operator
Corresponding secretary

Dean's secretary
Editorial assistant
File clerk
General clerk
Illustrator

Inventory clerk
Key punch operator
Key punch trainee
Laundry clerk
Library assistant

Library clerk
Mail clerk
Messenger clerk
Multilith machine operator
Night clerk

Office machine operator
Office manager
Office supervisor
Payroll clerk
Payroll key punch operator

Payroll records analyst
Payroll records clerk
Payroll tabulating machine operator
Post office manager
Proofreader

Publications production assistant
Receptionist
Records analyst
Records clerk
Registration clerk

Sales clerk
Secretary
Secretary - stenographer
Senior secretary
Statistical clerk

Stenographer
Stock clerk
Storekeeper
Stores clerk
Stores manager

Supply NCO
Switchboard operator
Tabulating equipment supervisor
Tabulating machine operator
Telephone operator

Typist
Verifier

4. HOUSEKEEPING AND OTHER STAFF

Building attendant
Building custodian
Building crew worker
Busman
Caretaker

Cattleman
Clean-up crew
Custodial worker
Dairyman
Dishwasher

4. HOUSEKEEPING AND OTHER STAFF (continued)

Farm maintenance worker
Farmer
Farrier
Garage worker
Gardener

Greenhouse worker
Groom
Guard
Herdsman
Housekeeper

Janitor
Kitchen crew
Kitchen helper
Kitchen porter
Laborer

Laundry worker
Linen room worker
Maid
Milk plant worker
Motor vehicle operator

Orchardman
Porter
Pot washer
Poultryman
Stock man

Truck driver
Utility worker
Waiter
Washer
Watchman

APPENDIX D

PHYSICAL PLANT INVENTORY SYSTEM

D.1. Functional Division Code for Physical Plant Space Inventory System

Digit Sequence

1st	2nd	3rd	
100			INSTRUCTION
	110		Scheduled classrooms
	120		Scheduled teaching laboratories
	130		Other instructional rooms; e.g., music practice, wrestling floor, etc.
	140		Offices
		141	Faculty
		142	Administrative (academic, departmental)
		143	Clerical (departmental)
		144	Teaching assistants
		145	Technical personnel, stock clerks, etc.
	150		Service rooms, miscellaneous instructional space, department shops, etc.
200			RESEARCH
	210		Contract research and other research supported by outside funds
	220		University research by staff and students, sponsored by University
	230		Other research
300			LIBRARY AND MUSEUM
	310		Library
	320		Museum and exhibition rooms
400			PUBLIC SERVICE
	410		Extension division and services
	420		Concerts, public lecture halls, and immediate service areas
	430		Other public service
500			ADMINISTRATION AND GENERAL
	510		Administration and business management
	520		Student services
	530		General institutional services; e.g., data processing, mail, telephone, etc.
600			PLANT OPERATION AND MAINTENANCE
	610		Central storage warehousing
	620		Plant operations (maintenance shops, machine shops, etc.)
	630		Motor pool and garages
	640		Other

Digit Sequence

1st	2nd		3rd
700	ORGANIZED ACTIVITIES RELATED TO INSTRUCTION		
	710	Laboratory school	
	720	Clinics	
	730	Agricultural operations	
	740	University press and publications	
	750	Intercollegiate athletics	
	760	Other	
800	AUXILIARY ENTERPRISES		
	810	Student center, union	
	820	Faculty club	
	830	Book store and merchandising services	
	840	Student health service	
	850	Other	
900	HOUSING AND RESIDENCES		
	910	Single men and dining halls if integral	
	920	Single women and dining halls if integral	
	930	Married student housing	
	940	Staff housing	
	950	Separate dining halls and cafeterias	
	960	Central dormitory services	
000	NON-INSTITUTIONAL AGENCIES AND OTHER NOT CLASSIFIABLE		
	001	State, regional, federal agencies	
	002	Professional organizations, agencies	
	003	Private agencies	
	009	Other not classifiable	

Following is an alternate numerical classification code for a physical plant space inventory system. The classification system follows the breakdown of physical plant into the twelve broad components separately analysed in this Manual. As such, an inventory based upon this classification system would be directly comparable to the programming estimates developed by use of the Manual.

This system focuses upon physical plant use by type of space. In order to obtain the kind of information desired (and that would be generated in part by the inventory system suggested in table D.1), it will be necessary to augment the data collection process with a cross-classification by location of space (by building) and administrative assignment of space (departmental control). By including this identifying information together with the space inventory data on the same data collection cards, it will be possible to obtain such information as the following: the amount and distribution of space by functional category within each building; the amount and distribution of space by functional category within each department; the amount and distribution of any category of space by department or building; and so on.

The inherent flexibility in this system eliminates the need to build into the inventory system the kind of identifying information that is implicit in the classification structure covered by table D.1. For example, consider the broad categories of food service space and staff and student service space. Food service facilities may be located in residence halls, faculty clubs, student center and so. Staff and student service space may be located in office buildings, classroom buildings, student center and so on. But these represent locational characteristics; the amounts of these types of space in each building can be obtained by a simple sorting process followed by aggregation of any particular functional category within the broad space categories. Similarly, a shift in focus to a question of administrative control over space also can be handled by simple sorting and tabulation along departmental lines. Thus, it is possible to determine the amounts of any of the broad categories (or sub-categories) of space assigned to individual departments (instructional or non-instructional), auxiliary enterprises, non-institutional agencies such as state and federal units located on campus, and so on.

The adoption of either of the space inventory systems presented in this appendix will, of course, have to be decided in terms of the information needs of the institution. There are advantages and disadvantages to each system. But each will serve to provide the necessary data with regard to present physical plant utilization and permit the planning analyst to compare future needs by type of space with the present availability of such space.

D.2. Alternate Numerical Classification Code for Physical Plant Space Inventory System

- 0100 Classroom space
  - 0110 Scheduled rooms: lecture-auditoriums
  - 0120 Scheduled rooms: regular classrooms
  - 0130 Scheduled rooms: seminar rooms
  - 0170 Service space

- 0200 Special purpose instructional space
  - 0210 Teaching laboratories and other scheduled rooms
  - 0270 Service space

- 0300 Office space
  - 0310 Faculty and other professional
  - 0320 Student
  - 0330 Supporting technical
  - 0340 Supporting clerical
  - 0350 Other staff
  - 0370 Service space

- 0400 Research space
  - 0410 Staff project space
    - 0411 Faculty
    - 0412 Other professional
    - 0413 Student
  - 0420 Technical services and specialized large-scale equipment installations
  - 0470 Service rooms

- 0500 Library space
  - 0510 Reader station space
    - 0511 General reading rooms
    - 0512 Special reading rooms
    - 0513 Carrels
  - 0520 Book storage space
    - 0521 Closed stacks
    - 0522 Open stacks
    - 0523 Reading rooms
    - 0524 Reserve
    - 0525 Other
  - 0530 Service space
    - 0531 Reader services
    - 0532 Technical services

- 0600 Museum and gallery space
  - 0610 Display space
  - 0620 Service space
  - 0630 Storage space
  - 0640 Other

- 0700 Athletic activities space
  - 0710 Playing areas (courts, exercise rooms, etc.)
  - 0740 Pool
  - 0750 Spectator seating
  - 0760 Lockers
  - 0770 Shower and toilet facilities
  - 0780 Other

- 0800 Housing space
  - 0810 Single students, male
    - 0811 Living quarters: single occupancy
    - 0812 Living quarters: double occupancy
    - 0813 Living quarters: other
    - 0815 Toilets, washrooms, showers
    - 0817 Recreational and service space
  - 0820 Single students, female
    - 0821 Living quarters: single occupancy
    - 0822 Living quarters: double occupancy
    - 0823 Living quarters: other
    - 0825 Toilets, washrooms, showers
    - 0827 Recreational and service space
  - 0830 Married students and staff
    - 0831 One-bedroom units
    - 0832 Two-bedroom units
    - 0833 Other
    - 0837 Recreational and service space

- 0900 Food service space
  - 0910 Family-style service
    - 0911 Dining area
    - 0912 Preparation, serving, cleanup
    - 0913 Storage and miscellaneous
  - 0920 Cafeteria service
    - 0921 Dining area
    - 0922 Preparation, serving, cleanup
    - 0923 Storage and miscellaneous
  - 0930 Snack bar service
    - 0931 Dining area
    - 0932 Preparation, serving, cleanup
    - 0933 Storage and miscellaneous
  - 0940 Other

- 1000 Staff and student service space
  - 1010 Lockers
  - 1020 Lounges, common rooms, reading rooms
  - 1030 Meeting rooms
  - 1040 Post office facilities
  - 1050 Activity areas

1100 Miscellaneous other space

1200 Physical plant maintenance and operations
- 1210 Maintenance shops
- 1230 Heating plant
- 1240 Garages
- 1250 General storage and warehousing
- 1270 Other service space
  - 1271 Janitor's rooms
  - 1272 Mechanical equipment rooms
  - 1273 Public toilet facilities: men
  - 1274 Public toilet facilities: women

1300 Unused or unassigned